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Марк
СОЛОНИН

РАЗГРОМ 1941

НА МИРНО СПЯЩИХ АЭРОДРОМАХ...

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Abstract

From Bidmaker - in this version of the book, the tables are made in graphical form, since the originally entered tables were not correctly converted to other formats.

Mark Solonin's book "At Peacefully Sleeping Airfields ..." became the main bestseller of 2006, selling out in record numbers. Now, on the eve of the 70th anniversary of the outbreak of World War II, a leading military historian has returned to the aviation theme, radically reworking, correcting and supplementing the first edition of his book, in fact rewriting it.

Why, having a huge numerical superiority, the Red Army Air Force was defeated in the very first days of the Great Patriotic War? How did the Luftwaffe manage to seize complete air supremacy so quickly? Where did the vaunted "Stalin's falcons" who swore to keep "the tranquility of our borders" gone, threatening to crush the enemy with "little blood, a mighty blow"? An aviation engineer by

education, Mark Solonin convincingly, with facts and figures, proves the complete inconsistency of the Soviet version of the events of 1941, which explained the crushing defeat of our aviation by the “suddenness of an enemy strike”, and gives his own answers to the most complex, acute and “inconvenient” questions of national history .

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Mark Solonin Defeat
1941 Second

edition, revised and
supplemented

Moscow
"YAUZA"
"EKSMO"
2009

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Part 1
PLANES

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Chapter
1 250 000

From the first days of the Great Patriotic War, German aviation seized air supremacy. This thesis has never been questioned in Soviet military history literature. Every time our military historians needed to explain the next defeat, the next loss of people and equipment, the next failure to follow orders and the disruption of all plans, it appeared - the invincible and legendary, omnipotent and ubiquitous German aviation. Like a ferocious Valkyrie from the ancient Scandinavian sagas, they sweep through the writings

villages domestic scientific and historical
of Messerschmitts and Junkers, destroying hundreds of warehouses and train stations, thousands of tanks, dozens of ground troops ... And all this - in a couple of days, and most surprisingly - without any opposition from Soviet aviation.

By the way, where is she? Where are the "Stalin's falcons", the heroes of all pre-war films, the favorites of all girls, the beauty and pride of the Land of the Soviets? Where are the planes that set dozens of records and eclipsed the sun over Moscow during air parades? Where is the product of the production of huge aircraft factories, where is the result of the labor of millions of people who already in the “peaceful” years worked in three shifts, from dawn to dawn, to the sounds of a cheerful march (“The morning greets us with coolness ...”)?

The question is serious. Without a convincing answer to it, the traditional version of the causes of the unprecedented military disaster in the summer of 1941 begins to crack and fall apart. Communist historians understood this very well and therefore built a reliable, defense in depth around the myth of the "lightning defeat" of Soviet aviation. First of all - firmness in the voice and no doubts. Throughout Soviet historiography, the disappearance of the Red Army aviation was invariably regarded as an absolutely natural event, inevitable and the only possible one under the circumstances ***(“a sudden attack ... the absence of***

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radio communications ... huge numerical superiority of the enemy ... massive attacks on all airfields of the western districts ... ").

At the same time, Glavpur's "historians" - as befits people in uniform - were also preparing a second line of defense, to which they retreated in an organized manner (not like in the summer of 1941) with the beginning of perestroika, when, with the declassification of part of the archives, the myth of the numerical the superiority of the Luftwaffe crumbled like a house of cards. Their new, perestroika "truth" looked like this:

> in the light of recent publications, we quite unexpectedly learned that Soviet aviation, it turns out, outnumbered the enemy, BUT - the planes were hopelessly
>
> outdated, incomparable with the German ones ("poorly armed ... wooden ... burned like candles ... engines with a ***resource only 100 hours ... the fighters could not even catch up with the German bomber ... ");*** - the Luftwaffe aces, who had accumulated two years of war
>
> experience, were resisted by the untrained ***("six-month courses ... six hours of flying time" in a box*** boys ***prepared for parades, not for war ..., only 1192 crews were trained for night flights ...");***
>
> - vicious and gullible (at the same time!) Comrade Stalin believed in the peaceful intentions of his new friend Hitler (by that time he had shot almost all of his old friends) and for this reason he forbade preparing to repel the enemy, and honest commanders who tried to violate Stalin's "order" (what order? when? about what?) and bring the units into a combat-ready state - executed.

Finally, Viktor Suvorov, who stirred up the stagnant swamp of Soviet historiography with his books (“Icebreaker”, “Den M”), put forward a new, at first glance, very plausible argument. Today, only the most “lazy and incurious” do not know how everything was “really” - they were preparing for an invasion of Europe,

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they pushed all the aircraft to the border posts, and there the Germans covered it. The very first blow. At dawn on June 22. All.

The myth of the "first annihilating blow" fell to the heart of the domestic reader. It is diligently replicated even by those who were not noticed in sympathy for V. Suvorov (quite the contrary). Here, for example, quite a status historian D. Khazanov publishes a voluminous study entitled “Invasion. The beginning of the air war on the Soviet-German front. (56) The entire "invasion" was completed in one day on June 22. There is no June 23 and the following days, they are no longer interesting; in their place appears an analysis of the causes of the rout that took place. Here is a historian from Ulyanovsk, less known to the general public, M. Timin, who writes the book “On the Edge of the Main Strike. Causes of the defeat of the ZapOVO Air Force. Descriptions of the events of one single first day of the war seem to the author quite sufficient to begin to analyze the "reasons for the defeat." The second, third and all subsequent days are habitually left "behind the scenes" ...

It is difficult to argue with the general delusion, but let's try. First of all, we will try to find out - was there in reality that event, the causes of which have been so hotly discussed for more than half a century? Was Soviet aviation destroyed in the first days (or, in a more restrained version, in the first weeks) of the war?

> “...June 26th. Near 20 the enemy bombers attack us. Explosions are heard from all sides. Our fighters are not visible ....
>
> …27th of June. Enemy bombers again overtook us. It gets really hard...
>
> ... At dawn, the rain stopped, and planes immediately appeared, which continuously attacked parts of our division ... Every hour the number of enemy raids increased ... the enemy, at least here, had absolute air supremacy ... ... on the way to Dubno, the strike group had to
>
> survive a bomber raid ... our anti-aircraft guns, which increasingly bombarded enemy aircraft, could not stop the constant air attacks, the number of which increased to

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80 times a day ... Wave after wave of bombs fell on columns of military equipment. In the smoke of burning cars ... "

Isn't it true, dear reader, that's exactly how, exactly in such expressions, the events of the first days of the war are described in all those books that you had to read? The authors of the memoirs cited above also talk about the events of June 1941, and the war is the same ... But not Soviet, but German tank columns turned out to be ***“in the smoke of burning cars” (specifically,*** we are talking about parts of the 2nd Panzer Group of Guderian and the 1st tank group Kleist; in those days, the columns of the 3rd Panzer Group Gotha were in the thickest smoke, which on June 25 were dealt a massive blow by all the forces of the Air Force of the Western Front and long-range bomber aviation)

Is it possible to draw far-reaching conclusions based on the personal recollections of a couple of enemy soldiers? Of course no. Therefore, we turn to a solid source, to the monumental study "1941 - Lessons and Conclusions." (3) This monograph was published at the end of 1992 under the auspices of the General Staff of the then “unified armed forces of the CIS”, with an unusually modest stamp for work of this magnitude (only “for official use”), The head of the scientific team is Doctor of Military Sciences , Senior Researcher, Major General V.P. Nelasov. At the end of the book there are hundreds of references to the TsAMO funds (Central Archive of the Ministry of Defense). So, on page 151, in passing, in a subordinate clause, the authors of the monograph dropped the following interesting phrase:

“... out of 250 thousand sorties carried out Soviet aviation during the first three months of the war ... "

Two hundred and fifty thousand sorties in three months. Is this "destroyed" aviation? Stop. Maybe a mistake crept into a solid work? Did the typist girl print an extra zero? Not at all. All zeros are in place. We are opening Kozhevnikov's monograph “Command and Headquarters of the Air Force

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Red Army in the Great Patriotic War" (27). The author (again, with references to archival funds) reports that in the first 18 days of fighting (until July 10), front-line aviation carried out 45,000 sorties, and 2112 more sorties were made by pilots of the DBA (long-range bomber aviation). 47,000 sorties in 18 days very accurately "fit" into the final figure of 250,000 sorties in three months.

Everything is relative. In order to appreciate the above figures, we recall that in the five weeks of May-June 1940 (i.e., almost the entire time of the war and the defeat of France), French Air Force fighters completed 10,000 s/v. (21) During the first three weeks of the "Battle of England" German fighters carried out about 8 thousand sv. During the three most dramatic months of the grandiose air battle in the sky of Britain (August, September, October 1940), German bomber aircraft produced only 22 thousand St. (78) June 1942 was a record high for the Luftwaffe, when the Germans on the Eastern Front carried out (according to Soviet VNOS posts) 83,949 sorties of combat aircraft of all types. (76) We emphasize once again - this is a record, peak level of combat activity of German aviation (the situation obliged - on the ground there was an offensive decisive for the fate of the war from Kharkov to Stalingrad).

For the Soviet Air Force, the battle on the Kursk Bulge became a record for the intensity of hostilities. During the 40 long summers of 1943, Soviet pilots flew 89,300 sorties. (25) In other words, "destroyed and destroyed on the ground" Soviet aviation flew in the summer of 1941 with such an intensity that later both the Germans and the Soviet Air Force were able to achieve in only one month during the entire war! Why, then, in a huge number

of combat reports in the summer of 1941, the same phrases are repeated in every way: ***“during all the hostilities there is no our aviation ... enemy aviation is literally terrorizing our units, being unpunished ... our aviation is not visible ... the main losses and , most importantly, panic is inflicted by enemy aircraft, which, taking advantage of the absence of aviation in our sector, works all the time on low-level flights with almost impunity ... "?***

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By 1944 (not in three, but in all 12 months of the year), Luftwaffe fighters completed 69.8 thousand sorties on the Eastern Front, bombers and attack aircraft - 226.5 thousand sorties. (131) Total - 296 thousand sorties. For a whole year. And although German aviation by that time had irretrievably lost air supremacy over the Eastern Front, no one had ever characterized its condition with the words “destroyed”; no one has ever written that since 1944 it was impossible to see an aircraft with a swastika on the keel in the skies of the war ... Every medal,

as you know, has two sides. 250,000 sorties is an

incomprehensible amount. Much in comparison with the legend of "destroyed aircraft." A lot in comparison with meager results, all the more so when compared with the effectiveness of the Luftwaffe's combat operations, which, as is commonly believed (let's emphasize this remark with the boldest line!), Caused enormous damage to the Soviet troops.

On the other hand, 250,000 sorties in three months is surprisingly small. More precisely, this is five times less than what should have been, taking into account the initial strength of the Soviet Air Force and the possibilities of replenishing aircraft losses that this Air Force had at its disposal. At the moment, these statistics are available to everyone (a detailed review will be given in Part 3 of this book). According to the most minimal

estimate (with the exception of reconnaissance, medical and transport aviation, not taking into account the outdated I-15 bis biplanes and the slow-moving giants TB-3, not counting seaplanes from the Air Force fleets, not counting the emerging air regiments and divisions), grouping Soviet aviation, deployed by June 22, 1941 in the theater of operations, consisted of 4.8 thousand fighters and 3.5 thousand bombers. Based on the average - very average for mid-summer with a daylight hours of more than 17 hours - indicators of the intensity of the use of combat aviation (two sorties per day for fighters, one sortie per day for bombers), such a grouping would have to ensure the execution of 13 thousand combat sorties aircraft per day. In fact, in the first 18 days of the war, an average of about 2.5 thousand sorties were carried out.

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We are led to equally strange conclusions by a consideration of the actual number of sorties carried out for individual units and formations. Thus, two thousand sorties carried out by July 10 by DBA pilots mean (taking into account the initial number of nine long-range aviation divisions deployed in the western theater) only one sortie in 11 days. The term "long-range aviation" should not confuse the inexperienced reader. We are not talking about huge "flying fortresses", but about the twin-engine DB-3f bombers, the take-off weight of which was even less than the weight of the Junkers and Heinkels, which daily and repeatedly bombed the positions of our troops.

The notorious "sudden attack on peacefully sleeping airfields" did not reduce the number of DBA by a single aircraft. Long-range aviation on the eve of the war was deployed in the regions of Novgorod, Smolensk, Kursk, Kyiv and Zaporozhye. On June 22, not a single raid was made on these airfields, and the DBA pilots learned about the beginning of the war with Germany at rallies held in all units after Molotov's speech on the All-Union Radio.

Also at the rally at noon on June 22, 1941, the pilots of the 202nd BAP (bomber regiment) from the 41st air division learned about the outbreak of war. This regiment was based in the area of the city of Kingisepp (Leningrad region), and its airfields during the first days of the war were not subjected to any enemy influence. In a monograph on the history of the regiment's combat path, it is said that ***"with only 22 aircraft in the regiment, each aircraft had a load of up to three to four sorties a day."*** And then the final data are given from the report on the combat activities of the 202nd BAP on the Leningrad Front: ***“During the period of hostilities from June 22 to August 28, 1941, the regiment made 194 sorties ... 107 tons of bombs were dropped on the heads of the enemy, about 100 tanks were destroyed and self-propelled guns, 2 railway echelons, 1400 various vehicles and carts ... "(85)***

Let's not even discuss the amazing effectiveness of the regiment's combat operations, let's not think about the fact that if 194 sorties of SB light bombers were enough to destroy "100 tanks and 1400 vehicles and wagons" (i.e., about half of the equipment of the German tank division) , then how, in this case, after 250,000 sorties in the Wehrmacht, at least one living soldier and one

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surviving wagon ... Let's try to understand a completely simple, purely arithmetic question. The above number of sorties at the above intensity ***("each aircraft was loaded up to three or four sorties a day")*** the regiment had to complete in three days. By June 25th. And not at all by August 28th.

The Leningrad district is the northern flank of the war. The Air Force of the Odessa District and the Air Force of the Black Sea Fleet fought in the sky over the southern flank. A total of 900 fighters and 350 bombers. This air armada was opposed by the 4th Air Corps of the Luftwaffe, which on June 22, 1941 was armed with 116 Messerschmitts. Another 47 "Messers" were part of the III / JG-52 fighter air group, which covered the rear facilities of Romania. In one of the monographs devoted to the military operations of the summer of 1941 in Ukraine, we read: ***"In the most intense days of the battles for Berdichev, starting from July 13, only the aviation of the Southern Front operated in the 6th Army zone, making from 30 to 80 sorties." (40)*** From 30 to 80 sorties a day during the "most intense battles" could be performed by one or two squadrons of 12 aircraft each, and not by the Air Force of an entire front ...

Such was the "strange war" that we had in the summer of 1941. Huge Soviet aviation melted like snow in the spring sun, and then a little, what remained in the ranks was used by hardly one-fifth of its capabilities, but at the same time the number of sorties was in the tens and hundreds of thousands, but this is by no means an enemy stopped...

After these and many, many other facts became public, it became especially clear how wise and far-sighted Soviet historians acted, preparing in advance a bunch of tales about the "hopeless technical backwardness" of Soviet aviation. Without these blanks, they would have to answer a lot of unpleasant questions. And without question, everything is clear - plywood whatnots that cannot be compared with German aircraft. So they were killed like partridges ... Why did they lose the war in the air? Yes, because the planes were bad. And from what it is clear that the planes are bad? Because we lost the war in the air ... Looking ahead, we will immediately warn the reader that the whole discussion about the tactical and technical characteristics of the Soviet

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aircraft of the beginning of the war is completely meaningless. The author is deeply convinced that if our aviation were completely re-equipped with MiGs - and not with the then MiG-3s, but with the modern MiG-29s, then the result would be the same. The most respected readers - that is, those who do not intend to take anyone's word - are waiting for the next nine chapters, in which we will try to understand in sufficient detail two questions: why they fly and how they fight

aircraft.

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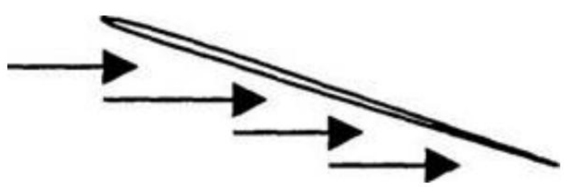
Chapter
2 WHY PLANES FLY

FLIGHT SPEED AND SPECIFIC LOAD

Planes fly through the air. Balloons filled with light gas float in the air, like a float in water. Parachutes and autumn leaves slowly fall to the ground, leaning on the air. And airplanes continuously “run into” the air with their wings set at a small angle to the airflow velocity vector. This angle in aerodynamics is called the "angle of attack" - an expression very beloved by journalists. It is important for you and me to understand and remember that the “angle of attack” is not at all the angle of inclination of the flight path with respect to the horizon (i.e., not the angle of diving or pitching), but the angle of inclination of the wing to the invisible and abstract “flow velocity vector ". (See fig. 1)



Rice.

1 Science says that an airplane flies because a zone of high pressure is created on the lower surface of the wing, due to which an aerodynamic force is generated on the wing, directed upwards perpendicular to the wing. For the convenience of understanding the flight process, this force is decomposed according to the rules of vector algebra into two components: the aerodynamic drag force X (it is directed along the air flow) and the lift force Y (perpendicular to the air velocity vector). (See fig. 2).

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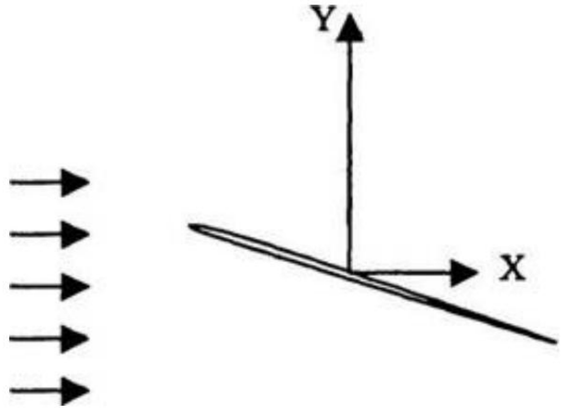

Rice.

2 The first conclusion from the above is that all good things come at a price, and in this sense the laws of aerodynamics are no different from the laws of life. You have to “pay” for lifting force with resistance. Moreover, for a large lifting force you have to pay with especially large resistance. That is, if when flying in a “calm” cruising mode, the resistance is approximately one tenth of the lift, then when flying at high angles of attack (at which the maximum possible lift is created), the resistance can increase to one fourth of the lift. It is intuitively clear that the aerodynamic forces depend on the wing area, angle of attack, air density and air

flow velocity (for a modern aircraft, the speed of which is much greater than the wind speed, the air velocity can be taken as the air velocity of the aircraft, which in the case of horizontal flight coincides with ground speed). Science claims that this dependence (like most of the fundamental laws of nature) is expressed by an extremely simple formula:

$$Y = C_y \cdot S \cdot \frac{\rho V^2}{2}$$

The dependence of the lift force on the wing area (S) and air density (ÿ) is directly proportional. That is, they made the wing twice as large - get twice as much lift, rose to a greater height, where the air density is half that of the ground - all aerodynamic forces are halved, etc.

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The influence of the wing profile shape and the current value of the angle of attack is expressed in the dimensionless coefficient Su .

The dependence of aerodynamic forces on the flow velocity is quadratic. The speed has doubled - the resistance has quadrupled, the speed has tripled - the resistance is already nine times greater, etc. This is probably the most important thing that "everyone should know." At least, anyone who wants to talk about the problems of military aviation on occasion. The quadratic nature of lift

versus velocity explains much of what we know and see. For example, an American "cruise missile" flies across the TV screen. From the cigar-shaped fuselage, two tiny narrow wings stick out to the sides. And with such frivolous wings, a “rocket” (more precisely, an unmanned aircraft) flies hundreds of kilometers and does not fall. Why? High speed (about 250 meters per second), squared, allows you to create sufficient lift even on such a small wing. The "cruise missile" is an example of an extremely "single-mode" aircraft. All speeds: "take-off", cruising, maximum are equal for her. But how to design a normal aircraft that needs to take off from the ground and whose maximum speed is much higher than the takeoff speed? For example, a typical modern fighter takes off at a speed of 250 km/h and accelerates in the air to a speed of 2500 km/h. Ten squared equals one hundred. This indisputable fact leads us to the idea that the wing necessary for flight at maximum speed could be a hundred times smaller in area than the "take-off" wing. Or, in other words, when flying at maximum speed, the wing turns into an extra burden, which not only has weight, but also creates huge additional resistance. I hope the reader is already demanding an explanation. In fact, what is a “big wing”? Big is how much? For example, a wing with an area of 18.3 sq. m - is this a "large" or "small" wing?

Let's count. The wing of just such an area had three fighters that were in service with the German aviation: "Fokker" D-1 (World War I), Focke-Wulf-190 D (World War II), Starfighter F-104 G (Cold War 60s).

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The maximum takeoff weight of these aircraft was 586, 4840 and 13170 kg, respectively. Accordingly, the Fokker had 32 kg of aircraft weight on each meter of the wing, the Focke-Wulf had 264 kg, and the Starfighter had 720 kg. This parameter - "specific load on the wing" - is a quantitative measure of the concept of "large or small" wing. The words "large wing" correspond to the technically literate expression "small specific load". And now the most interesting question:

why don't we make an airplane with a small wing (with a large specific load), and take off at a speed, if not equal, then at least close to the maximum? After all, a powerful turbojet engine is already on the plane, and in principle it can accelerate the plane to high speed. Alas, not everything is so simple. Firstly, to accelerate to a speed of “only” 1000 km / h, a concrete runway several tens of kilometers long will be required. The most important thing is that the plane with people must not only take off into the air, but also land on the ground. And the most powerful engine, and a huge strip can be done. Expensive, but possible. But it’s impossible to “meet” with hard ground at a speed of 1000 km/h and not be smashed to smithereens. Better not to try. Practice has shown that a landing speed of 270-330 km / h is the limit of what is possible even for a pilot with many years of training, landing the plane on a perfectly smooth "concrete". But what is called a “cruise missile” does not need to take off or land: it is launched from a carrier aircraft that is already flying at high speed, and the harder it crashes into an enemy object, the worse it is for him ...

Everything that we have already learned, we learned not in vain. Now you can already figure out why the "hopelessly outdated" Soviet fighters "could not catch up" with the German bomber.

A thin-looking wing is the main source of aerodynamic drag. Paradoxically, this is exactly what it is. Accordingly, increasing the specific load (i.e., reducing the wing area) is one of the most effective ways to achieve high flight speeds. To illustrate this conclusion, it is worth citing one textbook well-known example. The Supermarine S-6B racing aircraft, which set world speed in 1931, was ... a floatplane! record

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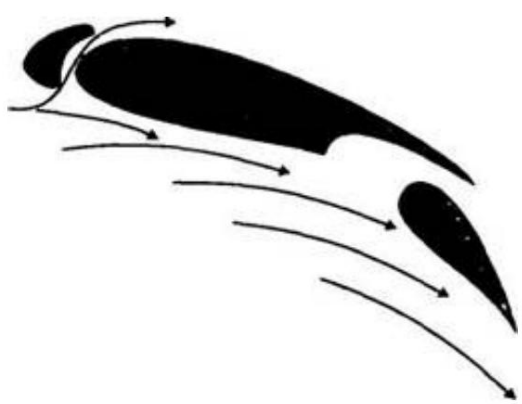
The aerodynamic resistance of two huge (fuselage-length) floats with struts and braces did not prevent the aircraft from accelerating to a speed of 655 km / h, which was twice the speed of serial fighters of that time. This miracle of technology had two explanations: the phenomenal Rolls-Royce engine and the very high specific wing load for that era - 178 kg / sq.m. And in order for an aircraft with such a “small wing” to take off and land successfully, designer Reginald Mitchell (the future creator of the legendary Spitfire) chose a seaplane scheme that both lands on “soft” water and accelerates on the “runway” almost unlimited length ... Military aviation began with a specific load of 30–40 kg per square meter and a wing whose profile

shape provided a lift coefficient of 0.7–1.0. With such parameters, a speed of the order of 80-100 km / h was required to take off the ground. Such a low takeoff speed made it possible to operate aircraft from the simplest unpaved airfields, and the requirements for maximum flight speed were then very modest: it flies faster than a steam locomotive, and all right. Then, at the turn of the 1920s and 1930s, technical and tactical prerequisites appeared for a significant increase in the specific load. The technical ones consisted mainly in the fact that various “means of wing mechanization” were developed, tested and put into practice: flaps

and slats. (See fig. 3)



Rice.

3 These devices allowed for a short time (at the time of takeoff landing) to increase the curvature of the wing profile, increase the wing area (retractable flaps) and the maximum allowable under the conditions

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stall angle of attack (this effect is provided by the slats). (See fig. 4)

Rice.

4 All these measures taken together made it possible to increase the lift coefficient to 2–2.5 units. Accordingly, even while maintaining the takeoff speed of no more than 100 km / h, it became possible to increase the specific load on the wing from 30-40 to 120-130 kg / sq.m. Then, technical improvements were supplemented by a change in the views of the military leadership on the tactics of using combat aviation. For bombers with a range of 500-1500 km, it was no longer necessary to be based on unpaved airfields in the immediate vicinity of the front line. Long-range bombers could take off on missions from a small number of large airfields located deep in the operational rear and equipped with large (1–2 km) long concrete runways. The concrete strip made it possible to increase the safe landing speed to 130–150 km/h. Taking into account the quadratic dependence of the lift force on the flight speed, such an increase in the allowable landing speed theoretically made it possible to increase the specific load to 200–250 kg/sq.m. In practice, things did not go so "far" immediately, but already in the second half of the 30s, bombers with a specific

load of 140-160 kg / sq. m, (German "Dornier-17", Soviet "DB-3", English "Blenheim", Italian "Savoy-Marchetti-79"). And this, as practice has shown, was only the beginning of the process of a steady increase in the specific load. The German "Junkers-88" and the Soviet "Pe-2" already in their first modifications had a specific load of 190 kg / sq. m, and ended the world war with bombers (the Soviet Tu-2 and the American B-26) with a specific

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load 230–250 kg/sq. m and the maximum flight speed, respectively, 547 and 510 km / h.

The laws of aerodynamics do not know such words as "fighter", "bomber", "attack aircraft" ... An aircraft with a "large wing" (low specific load) has great resistance. That is why fighters (not “hopelessly outdated Soviet”, but all fighters of that period) with a specific load of 100-140 kg / sq. m lost the ability to catch up with the bomber. True, due to the significantly greater thrust-to-weight ratio than that of a bomber (the thrust of a propeller installation divided by weight), the best fighters of the 30s (the Soviet I-16, the American R-36, the French MS-406, German "Bf-109D") overcame the aerodynamic drag of the "big wing" and accelerated to a speed of 460-500 km / h, while the maximum speed of the German "Junkers" 88 A-1 did not exceed 460 km / h. But - a small (by 30–40 km / h) superiority in speed does not always make it possible to catch up with an enemy bomber (the simplest calculation that the reader can make on his own shows that when an enemy bomber is detected at a distance of 5 km, the “catch time” will be in in this case, 9 minutes, and the “catch-up distance” is 70 km). All this is simple and clear. Something else is strange at first glance - what prevented the designers of fighters from increasing the specific load to the same extent as it was

done on bombers? This is a simple question, but to answer it we need to understand how planes turn in the air.

THRUST AND MANEUVERABILITY

A widespread misconception is that the aircraft turns in the air with the help of the tail, more precisely, with the help of the rudder located on the vertical tail. The tail for an aircraft is the most important thing (provides stability in general and maintaining the required angle of attack in particular), but it does little to help with a turn in a horizontal plane. The plane flies thanks to the wing and turns with the help of the same wing.

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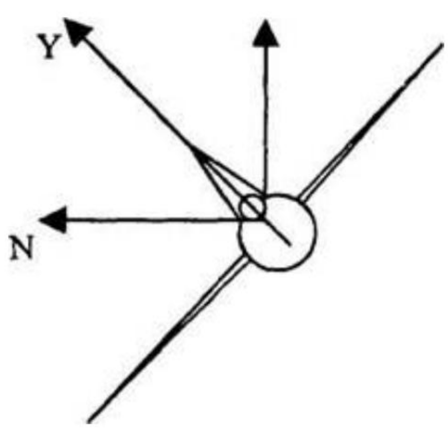
First of all, we must remember two paragraphs from a school physics course: motion in a circle (even if it occurs at a constant linear speed) is motion with acceleration (centripetal), and any motion with acceleration is possible only under the influence of a force. Acceleration is directly proportional to the force (this is Newton's second law), therefore, if we want to move with a large centripetal acceleration (i.e., both fly fast and turn sharply), a large force must be applied. Where can I get it? Engine thrust? No, this is not the greatest force we have at our disposal on board an aircraft. Even in modern fighters, the engine thrust is about 70-80% of the take-off weight of the aircraft. The biggest force is the lift force of the wing, which can be five or ten times the weight of the aircraft! And in order for the lifting force to “drag” the plane into a turn, you just need to bank the plane in the direction of the intended turn. (See Fig. 5) Thus, the turn begins with a roll, and a very deep one, after which the horizontal projection of the lift force (in Fig. 5 it is indicated by the letter N) begins to bend the flight path, and the aircraft begins to turn (turn). In order for the turn to be steep, i.e., to occur with a small radius and in the minimum time, the lift that the wing can

develop must be as large as possible, and for this, the specific load on the wing of the fighter must be as small as possible (i.e. for good maneuverability you need a "big wing").



Rice. 5

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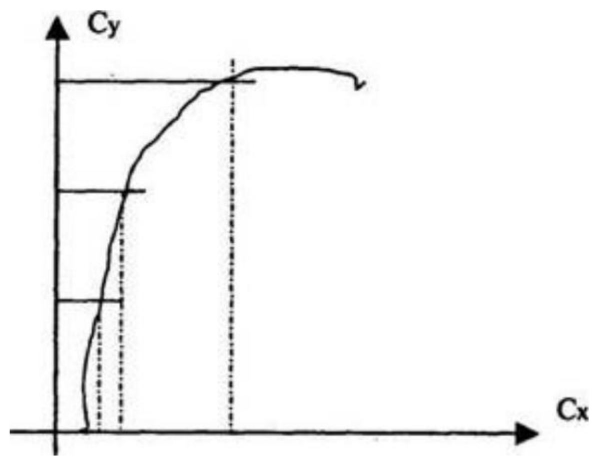
An increase in lift immediately causes an increase aerodynamic drag.

Moreover (as we noted above), the increase in resistance will be especially large when, in order to obtain a large lift force, we enter the flight mode with maximum angles of attack. (See fig. 6)



Rice. 6

To avoid or at least reduce this effect, it is necessary to give the aircraft a “large” wing (small specific load) at the design stage. And in any case, in order to overcome the increased resistance, it will be necessary to transfer the engine to the maximum thrust (maximum power) mode. In the end, a point may come at which the wing is still able to increase lift, but the engine thrust is no longer enough to overcome the ever-increasing resistance. That is why for high maneuverability you need not only a large wing, but also a large thrust (energy) armament. In numbers it looks like this. At extremely high angles of attack, the aerodynamic drag force reaches approximately one-fourth of the lift force. Accordingly, if at the same time the wing can develop a lift force six times the weight of the aircraft (overload 6 units), then to overcome the increased resistance, an engine with a thrust one

and a half times (!!!) greater than the weight of the aircraft (thrust-weight ratio 1.5 units) will be required). Such a thrust-to-weight ratio when using piston internal combustion engines was absolutely unattainable, therefore

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the limitation of the aircraft's maneuverability by the engine thrust (more precisely, by the thrust of the propeller unit) was most characteristic of fighters of the 1930s and 1940s. The typical value

of available overload at that time was 2–3 units. In more understandable categories - an overload of 2.9 units corresponds to the execution of a turn with a radius of 300 m in 21 seconds at a constant flight speed of 90 m / s (324 km / h). These figures were not chosen by chance, they actually exactly correspond to the parameters of the most massive fighters of the Second World War.

The new era ushered in by the advent of the afterburner turbojet made it more common for maneuverability to be limited by aerodynamic parameters of the wing. The enormous thrust of the jet engine makes it possible to overcome the growing aerodynamic drag, but the possibilities for increasing the lift force of the wing are not unlimited. At angles of attack of more than 15-20 degrees, the increase in lift first slows down, and then the worst thing that is inherent in the aerodynamics of the aircraft occurs - flow stall. The air flow breaks away from the upper surface of the wing, and the lift abruptly drops to zero. Stall in its very essence is an uncontrollable and spontaneous process, it will never occur simultaneously and evenly on the left and right wings. Therefore, a stall does not just lead to a “drawdown” of the aircraft, but to an erratic roll and rotation. In the worst case, erratic rotation turns into a “corkscrew”, from which it is not possible to get out until it hits the ground ... All sorts of aerodynamic tricks that are difficult to explain even for professionals make it possible in some cases to delay the onset of

a stall to very large angles of attack (20–30 deg.) . In combination with the huge thrust-to-weight ratio of modern fighters, this makes it possible to bring the available overload (lift-to-weight ratio) to 9 units or more. As a result, the modern Russian MiG-29 fighter, despite the very high (by the standards of the 40s) specific wing load (443 kg / sq. M), performs a steady turn in 15.3 seconds - faster than any fighter World War II (with the exception of our "I-16"). Such is the "roll call of generations".

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The problem, however, is that not every pilot can fly with such overloads. G-force causes blood to drain from the head to the legs (the sensation associated with this is called “black eyes” in aviation slang). A short-term loss of consciousness occurs already with an overload of 4-5 units. Special anti-g suits, an oxygen mask, a chair tilted to a “reclining” position, special training allow the pilot to fly the aircraft even with an overload of 7-8 units. But this is the limit. Further progress along the path of more and more disposable overloads is possible only on unmanned vehicles, an example of which is some types of air-to-air missiles that can briefly maneuver with a monstrous overload of 35 units!

Let's sum up some results. We already know where to start the "inspection" of the plate with the performance characteristics of the aircraft. The specific load and thrust-to-weight ratio are the two main parameters that determine the appearance of the aircraft and testify to the intention and qualifications of its (aircraft) creators. By the way, how many books have you, dear reader, seen in which these parameters are indicated? The

most difficult and controversial is the choice of specific load. We want to fly fast - we need to reduce the wing area (increase the specific load), we want to turn turns "around the telegraph pole" - we need a large wing that develops a large lift, i.e., the minimum specific load. For a fighter aircraft, the task becomes almost unsolvable: the fighter needs both high speed and high maneuverability. To somewhat mitigate this contradiction is possible only by increasing the thrust (energy) armament. Moreover, a large engine thrust is needed not only in order to overcome the aerodynamic drag of the wing, which sharply increases on the bend. It allows you to provide high acceleration performance and high vertical speed, which are also an integral part of the multifaceted concept of "maneuverability". But here comes the next problem.

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FLAME MOTOR

To create a qualitatively new fighter with greater speed and sufficient maneuverability, it was necessary not just to have an engine with more power (thrust), but a qualitatively new engine with a significantly higher power density (power divided by engine weight). Or, in other words, we needed an engine that, with the same weight, would develop more power. It was possible to radically solve this problem only in the era of jet aviation. The situation at the end of the 30s was such that the design of

the piston aircraft engine had already been perfected, and the specific power of the engines of the new “high-speed” generation fighters was approximately the same and had already reached the technically possible limit. There was at that time only one, the last unused reserve - the exhaust pipe.

Up to 40% of the energy of the fuel burned in the engine flies out into the exhaust pipe. If you use this energy, forcing the hot exhaust gases to rotate the turbine, and put a compressor on the axis of this turbine, which pumps excess air into the engine cylinders, then all engine parameters will noticeably improve. In the early 1940s, practically no one but the Americans managed to solve this problem - not in piece experimental samples, but in mass production. Those. "Driven" centrifugal superchargers were installed on all aircraft engines of the period under review, without exception, but to rotate the compressor, power had to be taken from the engine shaft. In other words, the increase in altitude was bought by reducing the useful power on the propeller, in full accordance with the principle of "stretched the tail - the head got stuck." It is worth noting that the US State Department appreciated the unique achievement of its engineers and forbade the sale of aircraft with a turbocharger installation even to the closest allies!

Another problem associated with the propulsion of a combat aircraft was the choice between using "liquid" or "air" cooled motors.

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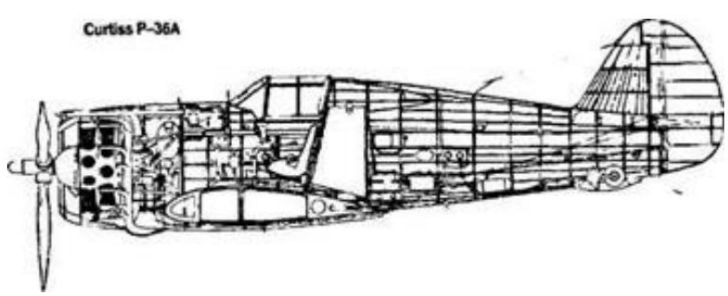
The quotation marks are not random at all. Any aircraft engine, including the so-called "liquid-cooled" engine, is air-cooled. There is nowhere else to dump the heat generated during the operation of the motor, except for the surrounding atmosphere. But this reset is organized differently. In an “air-cooled” engine, heat is directly carried away by the oncoming air flow from the ribbed surface of the cylinder heads, while for greater airflow efficiency, the cylinders are located across the flow, and the motor itself is assembled in the form of a multi-beam “star”. In a so-called "liquid-cooled" engine, the cylinders are arranged in a row, one behind the other along the flow; the heat is initially “removed” by the coolant washing the cylinder block, which is then pumped through the air-blown radiator by a pump.

Aviation began with "air-cooled" motors - simple, light and reliable (no radiator, no piping, no fluid pump to break or leak). Then, in pursuit of more and more speed, designers around the world turned to the "liquid-cooled" engine. Indeed, the elongated inline engine enters the air like a knife through butter, while the radial air-cooled star turns the aircraft fuselage into a blunt-nosed log. It would seem that the advantages of the "liquid-cooled" engine to reduce aerodynamic drag are obvious and indisputable: the nine cylinders of the radial "star" have a much larger diameter area than the same nine cylinders, but lined up along the flow. Passion for the "liquid-cooled" engine has become rampant, and the characteristic "sharp-nosed" fuselage has become an obligatory sign of a new generation of high-speed fighter.



American fighter "Hawk" P-36 with a two-row engine

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Soon, however, the designers had to make sure that in the pursuit of fashion they had lost sight of a lot. Firstly, you cannot line up 9-12 cylinders in one row. Powerful "liquid-cooled" engines became two-row, with the arrangement of two cylinder blocks in the form of the Latin letter "V". In addition, in a piston engine there are many other units that are hung on the cylinder block and increase the cross-sectional area. On the other hand, the developers of "air-cooled" engines have learned to make the engine in the form of two "stars" located one after the other, and at the same time provide sufficient airflow to the heads of the second row of cylinders. As a result, there were more cylinders (“double stars” of the 14- or even 18-cylinder parts), but at the

same time the cylinders themselves became shorter, and the overall diameter of the engine was smaller. So, for example, the ASh-82 air-cooled radial engine with a working volume of 41.2 liters had a diameter of 1.26 meters, and the AM-35 liquid-cooled in-line engine with a volume of 46.6 liters had a width of 0.876 m and a height of 1.09 m. The miracle, as we see, did not happen, the cross-sectional area of the radial engine still turned out to be larger than the cross-sectional area of \u200b\u200bthe V-shaped “liquid-cooled” engine, but this difference was by no means ninefold.

Most importantly, almost all of the drag savings achieved by using a "liquid-cooled" engine are lost in the radiator. Chip Laws

it is impossible to cancel, the cooling of the "liquid-cooled" engine essentially remains air, so the heat transfer area of the radiator should have been no less than the total area of the finning of the cylinders of the radial "star". To be more precise, the area of the "vent" fins can even be much smaller. Why? Heat transfer depends on the temperature difference. The permissible temperature of an air-cooled engine is determined by the physicochemical parameters of the engine oil and can reach 200 degrees or more. But the maximum allowable temperature of the “liquid-cooled” engine is limited by the boiling point of this very liquid, i.e., a level of 110–120 degrees (using not water, but ethylene glycol as a coolant).

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A very significant (6 tons of takeoff weight) confirmation of all of the above was the American P-47D Thunderbolt fighter. A huge blunt-nosed “jug” (as the pilots called it) with a two-row air-cooled “star” had a lower drag coefficient (!!!) than that of the sharp-nosed Messerschmitt, and, developing a speed of 690 km / h at high altitude, “ The Thunderbolt became one of the fastest piston fighters of World War II. Until the very end of the war, the "dispute" between radial and in-line engines was never resolved. The British conquered

from 1939 to 1945 exclusively on fighters with liquid-cooled engines, the Japanese - air-cooled. The US Air Force, Germany and the USSR ended the world war, having a pair of fighters in service (one with a radial, the other with an in-line engine): Thunderbolt and Mustang, Focke-Wulf and Messerschmitt, La and Yak. All American bombers were equipped only with air-cooled engines, almost all German and British ones were equipped with liquid ones. At the end of the war, Soviet aviation was armed with two types of bomber with air-cooled engines (“DB-3f” and “Tu-2”), but the Pe-2 light bomber with a liquid-cooled engine was the most massive ...

EXISTENCE EQUATION

We come to the most important thing. Central to understanding the aircraft design process is the law of nature, which in aviation is elegantly called the "equation of existence." This law (like the second law of thermodynamics) has many completely different formulations. For example: “it is impossible to change the weight of any component of the aircraft (engine, airframe, fuel, landing gear, armament) without changing the weight of all other components in order to maintain the original flight characteristics.” For example, an additional gun weighing 50 kg will require (if we want to maintain the original thrust-to-weight ratio and the associated acceleration and maneuverability characteristics) a small “additive” of engine power. A slightly more powerful engine will also be somewhat heavier. For him

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a heavier propeller and extra liters of fuel will be required (if we want to maintain the original range and duration of the flight). A heavier aircraft will require a strengthening of the chassis structure, and in order to maintain the initial specific load on the wing, it will be necessary to increase the wing area, which will lead to an increase in aerodynamic drag, to overcome which (if we want to maintain the maximum speed of the original aircraft) we will have to increase the engine power, which will become even heavier ... Will this "chain reaction" eventually end? Yes. How? The appearance of

a new aircraft, in which the relative shares of the weight of each unit in the total weight of the aircraft will remain exactly the same as before, but the entire aircraft as a whole will become heavier. This is another possible formulation of the "existence equation". Let us explain what has been said with a simple, but at the same time quite realistic numerical

example. Let's assume that some "original aircraft" had a 1000 hp engine. and two cannons with a total weight of 100 kg, while the weight of the cannons was 4% of the total weight (i.e., the aircraft weighed 2.5 tons). The addition of a third gun weighing 50 kg (while maintaining all the flight parameters of the original aircraft!) will result in a new aircraft in which the weight of the guns will still be 4% of the total weight, but this new aircraft will weigh 3.75 tons and will require an engine with a capacity of 1500 hp. (by default, we assume that the weight of the motor, its power and the thrust of the propeller unit are directly proportional). It is good if an engine of such unit power exists. Otherwise, it will not be possible to create a three-gun aircraft (while maintaining all the flight parameters of the original one), since the installation of two motors (750 hp each) on the wing radically changes aerodynamics (greater drag) and maneuverability (higher moment of inertia and lower angular velocity roll).

Noteworthy is the surprisingly small proportion of weapons in the total weight of the fighters of the beginning of World War II.

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"Wellington" The

desire for the impossible, i.e., the desire to maintain high horizontal maneuverability (at the level of the best biplanes of the mid-30s) and at the same time achieve a speed significantly exceeding the speed of the latest bombers, required a significant increase in thrust-weight ratio, i.e., the use of all more and more powerful motors. The weight of the propeller group reached half of the weight of an empty aircraft, and the fighter turned into an "engine with wings", where there was no room left for the main thing for the use of which the fighter takes off into the sky - weapons. The engine "ate" the plane ... I hope that all this is not too difficult. Many interesting conclusions follow from the "existence equation". In particular, at each specific stage of technology development, the

ratio of the relative weight of the airframe, engine, fuel, payload for aircraft with the same flight characteristics (speed, range, rate of climb, available overload) will be almost

the same.

Take, for example, a bomber capable of moving 1 ton of bombs over a distance of 2,000–3,000 kilometers at a cruising speed of 300–360 km/h. These requirements were met at the end of the 30s by the English Wellington, the German Heinkel-111 and Junkers-88, the Soviet DB-3f, and the Italian Savoia Marchetti-79. Outwardly, these are very different aircraft, with a different number and type of engine cooling, different aerodynamic and structural power schemes, made of different materials and armed differently.

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But - the share of fuel weight in normal takeoff weight is expressed in very similar figures: 21.2%, 27.6%, 27.6%, 32.5%, 24.8%. From the general series, apparently, two aircraft fall out: Wellington (21.2%) and: DB-3f (32.5%). But this is exactly the case when "exceptions prove the rule." "Wellington" flew the slowest of all (cruising speed of only 290 km / h), and therefore consumed fuel more economically, and "DB-3f" had a significantly longer flight range (up to 3300 km).

Let's return now to comparison of parameters of fighters. The relative weight of the structure (airframe + engine + landing gear) remained practically unchanged throughout the war, and for three dozen fighters of the most diverse characteristics and appearance, it fell into the range of 74-82% of the total take-off weight of the aircraft. In other words, about 18–26% of the takeoff weight remained for fuel and payload. For example, the design weight of the Messerschmitt Bf-109 E-3 fighter was 2016 kg; the payload (592 kg, or 22.8% of the takeoff weight) consisted of fuel and oil (330 kg), weapons with ammunition (172 kg), a pilot with a parachute (90 kg). And now let's compare the weight

characteristics of the E-series Messerschmitt (one of the lightest fighters at the beginning of the war) with the weight of the heaviest single-engine fighter at the end of the war.

The history of the creation and combat use of the American Thunderbolt (empty weight 4452 kg, normal takeoff weight 5961 kg) can serve as an excellent illustration of several fundamental rules of aircraft construction at once. The high specific load (214 kg per sq. m.) allowed the heaviest fighter of the Second World War to simultaneously become the speed record holder. A quarter of the 6 tons take-off weight of an American fighter is 1500 kg, but a pilot piloting a 6-ton aircraft is no thicker or heavier than others. Together with a parachute, it weighs no more than 100 kg. As a result, 1400 kg remains for armament, instrumentation and fuel in the Thunderbolt - three times more than that of the E-series Messer. That is why we find 6 or 8 heavy machine guns with a huge

ammunition load (in reloading version - up to 3400 rounds); in the cockpit -

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a complete set of all kinds of equipment (from a urinal to an autopilot and radio navigation aids); behind the pilot is a powerful armor, under his feet is a completely unique steel “ski”, saving the life of the pilot during an emergency landing on the fuselage. To attack ground targets, the Thunderbolt could lift 900 kg of bombs and 10 127 mm rockets (this corresponds to the combat load of our two Il-2 attack aircraft). The maximum flight range of 3780 km (with external tanks) made it possible to escort any bomber, even one that would be called “long-range” in Germany or the USSR.

Thus, the enormous efforts of American scientists and engineers who created a turbocharged engine with a unit power of 2300 hp for the Thunderbolt were not in vain. They made it possible to create a single-seat single-engine aircraft, which, with quite acceptable flight characteristics (and even record speed), had a take-off weight of 6 tons. The large takeoff weight (and hence the large payload weight) made it possible to create a highly effective multi-purpose weapon system on the basis of this aircraft, capable of performing a wide variety of combat missions over vast spaces. Six-ton aircraft and 2300 hp engine. is not only a huge achievement of

design thought. This is also a huge financial cost, a huge fuel consumption for each flight. Is it possible to solve the problem easier and cheaper? The Existence Equation suggests several possible paths. First, you can always "buy" the growth of some characteristics at the price of a decrease in others. Let's go back to the example of installing an additional third gun on a light fighter weighing 2.5 tons. It is not necessary to start a "chain reaction" of the growth of the absolute weight of all aircraft units. The easiest and fastest way is to fill the fuel tank with 50 kg less gasoline. At the same time, all flight characteristics of the original aircraft will be preserved. Except for one - flight range. Is this an acceptable price for increasing the firepower of weapons? In some cases, yes. And if you don’t need to fly far, then you can remove part of the instrumentation, and by saving weight, “buy” additional ammunition.

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There is a much better way to use the "existence equation" wisely. It is not necessary to improve some parameters at the cost of worsening others. You can (and should) go the other way. 50 kg or more of weight can be saved by reducing the weight of the structure. Since the weight of the airframe (fuselage, wing, tail) was about 35–40% of the weight of an empty aircraft for fighters of the Second World War era, even the most modest lightening of the structure made it possible to find an “extra” 2–3% of the weight, which made it possible to very noticeably increase the useful load.

“The most important thing you can’t see with your eyes.” These words of the famous pilot, writer and philosopher A. Exupery very accurately reflect the main problems and opportunities in aircraft design. The choice of the optimal structural and power scheme, careful study of the design of each unit and detail, the creation of high-strength materials - these are the efforts invisible to the prying eye that ultimately determine the aircraft's flight characteristics. Strange but true: the boring strength of materials (the boring doctrine of the strength of nuts, bolts, rods and shells) turned out to be at least as important as all the beauties of aerodynamics. Let's take another illustrative example.

At the turn of the 1930s and 1940s, a number of fighters with 1050–1100 hp engines were developed and put into service with the Air Forces of the leading countries of the world. With almost the same engine power and maximum speed, the weight of these aircraft turned out to be very different (see Table 1).

Table 1

Название	Скорость, км/ч	Вес пустого, кг
ЛаГГ-3 (СССР)	560	2 680
Р-4 С «Томахоук» (США)	545	2 636
«Як-1» (СССР)	569	2 445
«Спитфайр» Mk-I (Англия)	582	2 261
«Мессершмитт» Bf-109E3	560	2 184
«Блох» МВ-152 (Франция)	500	2 097
«И-180» (СССР)	575	1 815

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Moreover, it cannot be said that the light weight of the design of the leaders was “bought” at the cost of reducing the power of weapons. In terms of such a parameter as the “weight of a second salvo”, the Polikarpov I-180 was equal to the Tomahawk (1.86 kg / s and 1.84 kg / s) and surpassed the Spitfire (1.86 versus 1.52 from the English "fireman"). As for the low-speed French Bloch, it was equipped with the most powerful and therefore the heaviest weapons among all of the above fighters (two Hispano Suise 20 mm cannons and two 7.7 mm machine guns, the weight of a second volley was 3.2 kg / sec). The

above table should not be considered as a “rating of the qualifications of designers”, although, of course, the weight of the design of the notorious “new types of fighters” (“LaGG-3” and “Yak-1”) is impressive. The most important things you can't see with your eyes. The excess weight of the LaGG structure is most likely the result of unfortunate haste in an effort to fulfill the “task of the Party and the Government” on the technologies and equipment of a furniture factory (unfortunately, this is not a joke). The low weight of the I-180 and Bloch design testifies not only to the high qualification of the developers, but also to the undoubted advantages of a light air-cooled engine. The heavy weight of the Tomahawk design may have been due not to weight design errors, but to the large safety margins of the airframe. Such an assumption (an exact answer requires a serious analysis that goes beyond the scope of this chapter) can explain the fact that a heavy and low-maneuverable “axe” turned into a fighter-bomber, which, in terms of bomb load (450 kg) and flight range (1127 km), was almost not inferior to Soviet twin-engine bomber "Pe-2".

STEEL HANDS-WINGS

The foregoing is the minimum minimorum, having understood which even a non-specialist will be able to meaningfully read and understand a popular book on the history of aviation in the future. More for such purposes is not required. In any case, the discussion of purely special production and technological issues is redundant in this case. And I would not tire readers with another portion of indigestible technical

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terminology, if the incessant chorus of aggressively ignorant ranting on the topic of "plywood Soviet aircraft" did not make necessary some additional

explanations.

Even against the background of many other deliberately false fabrications about the "technical backwardness" of the Stalinist empire, delusional arguments about "plywood planes burning like candles" are striking in their rare absurdity. Let's start with the fact that it was Soviet Russia (although it was not the birthplace of elephants) that was the pioneer of all-metal aircraft construction. In August 1922, the first batch of domestic duralumin was produced in the USSR. On May 24, 1924, the first Soviet all-metal aircraft ANT-2 made its first flight. In the next year, 1925, the design bureau of A.N. Tupolev creates a heavy bomber "TB-1". Not to mention the many innovative design solutions that determined

the main path for the development of military aviation for many years to come, the TB-1 was larger in size than any metal aircraft of its time. Finally, on December 22, 1930, the world's first heavy four-engine bomber, the all-metal TB-3 (ANT-6), made its first flight. In terms of takeoff weight (20 tons) and bomb load (5 tons), this aircraft of 1930 surpassed the main types of German serial bombers at the end of World War II. The all-metal giant was produced in a large series (a total of 819 TB-3s were built), and on its basis in the USSR (again, for the first time in the world), strategic aviation was created as a special type of armed forces. Of course, things could not do without the theft of Western (German in this case) technologies. A.N. Tupolev was not the first. The first was still G. Junkers. But in Germany, defeated and plundered under the Treaty of Versailles, Junkers was not allowed to turn around. But the leadership of Soviet Russia offered the ingenious German engineer a generous contract and a huge plant in Fili (future aircraft plant No. 22). The drawings and technical

documentation from the concession plant were "secretly seized" (this term was used in the report of the Chekists addressed to People's Commissar of Defense Voroshilov), then they lured leading specialists from the Junkers company to work in the Union, after that

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the contract with Junkers was terminated ahead of schedule. He even tried to sue - but it's ridiculous. The Bolsheviks, even without the decision of a corrupt bourgeois court, know that they are always right ... Yes, the methods by which the Stalinist empire took a leading position in the world aircraft industry were not legal. But we are not discussing methods in this chapter, but results. The results were as follows: -

I-16 fighter. All-wood fuselage: a shell glued from birch veneer (“veneer” is a thin wooden sheet; sometimes veneer is called “single-layer plywood”), with a total thickness of 2.5-4 mm, reinforced with wooden frame frames, spars and stringers made of pine slats. Wing center section: truss spars, welded from steel pipes; truss ribs made of duralumin profiles; sheathing - duralumin sheet. Detachable parts (console) of the wing: beam spars with steel shelves and duralumin wall; sheathing -

canvas;

- I-153 fighter. Fuselage: welded spatial truss made of steel pipes with duralumin transverse frames; sheathing - canvas. The power elements of the wings (it was a biplane aircraft) are solid wood; wing skin - plywood or canvas, braces between the wings - steel tape; - MiG-3 fighter. The fuselage is detachable. Front compartment: spatial truss,

welded from steel pipes; sheathing - removable duralumin panels. Tail Compartment: A five-ply birch veneer shell reinforced with pine lumber stringers and bakelite plywood box-section frames. The center section of the wing is all-metal, the shelves of the main spar are steel, all other power elements are duralumin. The wing consoles are solid wood: the main spar is made of “delta wood” (a kind of multilayer high-strength plywood), the walls of the ribs are made of bakelite plywood, the skin is five layers of birch veneer; - short-range bomber "Su-2". Wooden fuselage: Bakelite plywood shell reinforced with wooden frames and stringers. All-metal wing: beam spars with steel shelves and duralumin wall; sheathing made of duralumin sheet;

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- front-line bomber "SB". The fuselage is all-metal: a shell made of duralumin sheets 0.5-1.0 mm thick, reinforced with frames stamped from duralumin. The wing is all-metal: spars of the center section are truss, welded from steel pipes, spars of the wing consoles are beam; sheathing made of duralumin sheet; - long range bomber

"DB-3f". The fuselage is all-metal: a shell made of duralumin sheets 0.6 mm thick, reinforced with duralumin box-section frames and stringers (U-shaped section. All-metal wing: beam spars with steel shelves and an duralumin wall, sheathing made of an duralumin sheet 0.6 mm thick; bomber " Pe-2 "Fuselage - high-speed all-metal: thick shell

reinforced with made of duralumin sheet 1.5–2 mm thick, stamped duralumin frames, no stringers. All-metal wing: beam spars with steel shelves and duralumin wall; ribs stamped from duralumin sheet; sheathing made of duralumin sheet 0.6 mm;. Dear reader, if you have read this, then I admire your patience and ask you to re-read the entire list carefully. It lists almost all the main types of combat aircraft of the Soviet Air

Force that entered the war on the morning of June 22. Where are the plywood planes?All twin-engine bombers are all-metal, the Su-2 light single-engine bomber and all fighters are of mixed construction (although plywood, along with duralumin, wood and steel, is also found in them). Having understood the actual state of affairs, we will now try to understand its causes and consequences. To begin with, a few words about “burning candles”. Try to light a piece of plywood. Be persistent. If you succeed, run with this "torch" at a speed of 100 meters per second. This is

very modest - World War II bombers had a cruising (not maximum!) speed of 300-350 km / h (i.e. 83-97 m / s). In such a "wind" no plywood, no tree will burn. Fuel burns in a burning plane - hundreds (or even thousands)

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liters of aviation gasoline. At an air flow speed of 500–700 km/h, the burning gas tank of a falling aircraft turns into a kind of “blowtorch”, in the torch of which even duralumin burns (by the way, aluminum is an excellent fuel, which is included, as the main component, in combat incendiary mixtures: pyrogel and thermite). The ability of an aircraft to overcome enemy air defenses and still not burn out depends on many reasons (we will discuss some of them in the following chapters), but certainly not on the skin material. Further. The duralumin sheathing does not create any

protection for aircraft "insides". The least that an aircraft has to face in air combat is a bullet from a rifle (7.62-mm) caliber machine gun. An armor-piercing bullet of this caliber pierces 5-7 mm of ordinary (non-armored) steel. Thin (1–2 mm) duralumin sheathing she simply “does not notice”. The large-caliber (12.7 mm) aviation machine gun "BS" - the standard armament of Soviet fighters and bombers during the war - pierced an armor shield 15 mm thick at a distance of 200 m. A large-caliber machine gun is still far from the "top" of aviation weapons; there were cannons, and it’s good if “only” 20-millimeter ones ... Plywood, canvas, duralumin sheet, tissue paper sheet, thin steel sheet equally did not create any barrier to the striking elements of aviation and / or anti-aircraft weapons. The most minimal protection (capable of stopping small fragments of anti-aircraft shells and rifle-caliber bullets) required the use of armor steel 8-10 mm thick.

With a skin of such weight, not a single aircraft of that era could have taken to the

skies ... It is difficult to explain the incredible vitality of ignorant delirium about "wretched plywood aircraft" with arguments of reason. Maybe it is supported by "practical experience" - everyone knows that a steel pipe is stronger than a wooden handle of a shovel, a stone fence is stronger than a wooden picket fence ... All this is true, but in relation to aviation, only power elements of EQUAL WEIGHT can be compared. That is, a steel rail should not be compared with a board from a fence, but with a high-quality (without a single knot) wooden beam of such a section at which the weight of the beam becomes equal to the weight of the rail. Her

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it is a log and it is advisable to try to break it with a punch or a leg. And even better - heads ... After that, it will forever be remembered that in terms of specific strength, high-quality aviation pine surpasses carbon steel, is approximately equal to duralumin and is second only to high-strength alloy steel.

Speaking seriously, the choice of material is secondary in relation to the choice of a structural-power scheme. This is a very interesting topic, but it is rather difficult to explain it “on the fingers”, without formulas and drawings. For some idea, let's give two examples: a kayak and an egg. The kayak is a frame made of light duralumin tubes, on which fabric lining is put on. The sheathing separates the water from the tourist, while the strength of the structure is provided by the frame. The fabric can be completely removed - the frame will not become less durable; it will be possible to sit on it or use it as a bridge over the stream. In science, this is called a "spatial truss with a broken skin."

There is no carcass in the egg. Strength - and very high - is provided by the shell alone. The main condition for maintaining strength is the stability (invariance of shape) of the shell. As long as there is content inside the shell (“reinforced thin-walled shell”), only a very strong person can break an egg in his fist. An empty shell (“unreinforced shell”) will be broken even by a child.

"Mosquito"

Egg and kayak - two diametrically opposite poles; real structural-power schemes of the fuselage and wing of the aircraft could be trussed (a frame made of thin pipes covered with

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canvas), and shell (thick "working" skin with a small number of reinforcing frames), and mixed (relatively thin skin with a large number of longitudinal spars / stringers and transverse frames). The choice of a structural power scheme predetermines the optimal set of materials. It is most convenient to weld a rigid truss from steel pipes and cover it with a cloth. It is better to glue a working shell with a minimum number of reinforcing elements from wood veneer (thin duralumin, even more so steel, a shell of equal weight will be so thin that local buckling occurs). The mixed design of the wing involves the use of high-strength steel longitudinal elements (spar flanges) and in combination with a relatively thin duralumin shell reinforced with ribs. There are many other, sometimes quite unexpected, constructive schemes. An example of such an unusual scheme known to every specialist is the design of the English (strictly speaking, it was made in

Canada) Mosquito bomber. The fastest bomber of the Second World War (maximum speed of 670 km / h at an altitude of 8.5 km) was all-wood. The fuselage of this amazingly beautiful twin-engine aircraft, according to its structural power scheme, was as close as possible to an egg, only its “shell” was not simple, but three-layered: a thick layer of balsa was glued between two layers of thin plywood. Balsa is like cork, only stronger and lighter. In the end, the all-wood aircraft was distinguished by the lowest level of losses in the Royal Air Force - in 26255 combat sorties, only 196 aircraft were irretrievably lost from the fire of German anti-aircraft guns and fighters, that is, the probability of a safe return to their home airfield was 99 for the Mosquito crew .25%. It only remains to add that such fantastic survivability was achieved on an aircraft devoid of any defensive weapons!

A bright, dazzlingly bright and deafeningly loud example of the use of wood in the construction of a combat aircraft was the German Messerschmitt Me-163 rocket fighter. This miracle machine thanks to the use of a rocket engine with a thrust of 1700 kgf

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had absolutely phenomenal speed (955 km / h) and rate of climb (80 m / s). At the same time, the wing and vertical plumage (there was no horizontal at all) of the fastest fighter of World War II were all-wood ...

Nevertheless, at the end of the 40s, the tree was forever gone from combat aircraft designs.

But not at all because the duralumin planes burned with a less bright flame. There are three main reasons for this phenomenon. The first is technological. Working with wood is incredibly difficult. Steel rail can be made by casting, rolling, forging. A duralumin profile of such a section (in science it is called an "I-beam") is obtained by rolling or pressing. It is enough to debug the technology once and make the appropriate equipment - and the profile can be "driven" by millions of meters. How to make a wooden I-beam? Cut from a bar, while sending 90% of the wood to shavings? Collect from three parts? How and with what to connect them? Gluing takes a long time and is not very reliable; assembly on screws is extremely laborious; the screw is a stress concentrator and leads to cracking of the wood ... It is impossible even to compare the complexity, duration and laboriousness

of gluing a multilayer plywood shell and forming an duralumin sheet (one movement of the hydraulic press plunger). Gluing requires the strictest compliance with the requirements for temperature, humidity and dustiness of the room, surface preparation; finally, gluing and drying take time. Adhesives (resins) used in the manufacture of plywood are expensive, are a product of complex chemical production, and in war and blockade conditions they may not be available (this is exactly the trouble that happened in the USSR with the production of delta wood).

An unavoidable disadvantage of wood as a structural material is the instability and unpredictability of its physical and mechanical properties. An extruded profile made using the same technology from aluminum of the same heat will have unchanged strength. For greater certainty, a random inspection of several samples from a large lot can be carried out. There are no hundred identical trees in nature, worse than that, there are not even two identical pines, even if they grew on the same plot. At

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When working with wood, it is necessary to take into account the age, and the place of growth, and the humidity, and the orientation of the fibers - moreover, for each individual blank...

The second reason for abandoning wood in aircraft construction is economic. The durability of a wooden aircraft in the conditions of the Russian climate is calculated, strictly speaking, by one seasonal transition from winter to summer. After that, it is already necessary to dry it, check it, measure out all possible deformations of the wing and tail (let's not forget that, for example, changing the installation angle of the horizontal tail by only 2-3 degrees will lead to a complete change in all stability and controllability parameters). In that era, when the change of types of fighters took place every year or two, this was still somehow reconciled. But a Thunderbolt-type fighter was already worth 80 thousand dollars (expensive 1944 dollars!), And he could not afford to throw away such expensive equipment every year

nobody.

The last point in the history of wooden aircraft was the size. Yes, size matters too. Where to find such a pine from which one could cut a spar of the wing of the B-29 bomber (wingspan 43 meters)? Dead metal completely replaced living wood from aircraft construction, but the old masters remembered for a long time the time when the smells of coniferous forest were fragrant in the factory shop ...

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Chapter
3 THE MOST IMPORTANT AVIATION

In the previous chapter, we briefly and very simply considered some of the issues that arise in the design of an aircraft. In this chapter, just as briefly and fluently, we will consider an incomparably more complex question: what performance characteristics should an aircraft have on the basis of which a certain combat system is built? This question is not only the most difficult, but also the most important. The history of aviation is replete with examples of how an error in formulating the requirements of a technical assignment led to the appearance of a magnificent aircraft that no one needs for anything. And in order to correctly formulate the requirements for a combat aircraft, it is necessary to predict as accurately as possible the nature of the hostilities of a future war, “see” the battlefield and understand what tasks on it (above it) the designed weapons system can solve. We will begin our review of the problems and

solutions that arose at the turn of the 1930s and 1940s by considering the tasks of the most important component of the Air Force. This, of course, is bomber and assault aircraft (now they are united under the general name "strike aviation"). It is the heavy, often clumsy and clumsy bomber that performs the main task of the war - it destroys manpower, military equipment, control and communication centers of the enemy, destroys its economy and transport system, and undermines the morale of the population. It is the bomber that does the main thing for which the Air Force was created. And although the fighters got (at least in the USSR) most of the fame, films, songs and orders, although it is to the graceful and swift fighter that the unrelenting interest of military history lovers is riveted to this day, the truth is that the fighter is just only one of the tools to counter enemy bombers. From the very beginning (i.e., from the end of the First World War), a long and intractable dispute began about what exactly should become

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the main object on which bombing strikes are carried out:
industrial enterprises and political centers in
deep behind enemy lines, or:
- areas of concentration, transport hubs and supply bases
troops in the operational rear,
or - enemy troops on the battlefield.

Of course, it was good to have aviation that is able to equally successfully solve all these tasks (and even a dozen other tasks), but such an overstrain of production can destroy its own economy without any participation of the enemy (approximately according to this scheme, the Soviet economy collapsed, which could not stand it in the end after all, the pace of the arms race, which was given to it by the "invariably peaceful" Soviet foreign policy). So it was necessary to choose and concentrate the main efforts on what was recognized as the main one. Surprisingly, it is a

fact that completely hypertrophied ideas about the possibility of achieving the strategic goals of the war by the efforts of long-range bomber aviation alone arose already at a time when the "heavy" bomber was an absurd multi-winged cuttlefish with the speed and carrying capacity of a light modern Gazelle-type truck. Even before the end of the First World War, the American General Spaatz (in the future - one of the founders and leaders of the US Air Force) submitted a report to the military cabinet, which stated that in the near future "actions from the air, entailing the devastation of enemy territory and the destruction of industrial and ***administrative centers ... can become the main ones, and the actions of the army and navy - auxiliary and subordinate.*** At the same time (in 1920), the Italian military theorist Douai wrote the famous phrase that in the modern era the land army is turning into ***"an auxiliary means used for transport purposes and the occupation of territory."***

While discussions were being held in the West and fantastic plans were being made, the four-engine TB-3 was built, tested and put into mass production in the Soviet Union. When flying to a maximum range of 2500 km, the bomb load of this aircraft was 2 tons.

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In 1931, the Tupolev Design Bureau received an assignment to design an even heavier six-engine TB-4 bomber. With a takeoff weight of 33 tons, he had to fly 2000 km with a load of 4 tons.

Let's pay tribute to the Soviet military leadership - it promptly abandoned the use of a "flying barge" with a maximum speed of 200 km / h and a ceiling of 3 km as a strategic bomber, and the TB-4 did not go into series. In the terms of reference of 1934 (according to which the legendary TB-7 was designed), the emphasis was decisively shifted: the bomb load at a maximum range of 3000 km was reduced to 2 tons, but it was required to achieve a maximum speed of 400 km / h and a ceiling 12 km. Behind these changes in the terms of reference was the finally understanding of the most important fact that an aircraft capable of moving several tons of cargo “from point A to point B” is not at all a “long-range strategic bomber”. Even if the distance from point A to point B is in the thousands of kilometers.

First of all, we note that in the face of enemy opposition, flying to “point B”, and even returning back, is possible only if there is a powerful system of active and passive protection. It is worth dwelling on this issue in more detail. The bomber has two enemies: anti-aircraft guns and enemy fighters. There are many more ways to counter.

Active defense consists in the fact that the bomber crew fires at attacking enemy fighters, bombs (and when flying at low altitudes and fires from machine guns and cannons) anti-aircraft artillery positions. The possibilities of active defense increase many times if the factor of interaction is included in the matter. The mere massing of the number of bombers and the formation of dense battle formations makes it possible to meet enemy fighters with concentrated fire from hundreds of barrels. Active defense becomes even more effective (however, in this case the very word "defense" becomes somewhat inappropriate) if heavy bombers interact with fighters and high-speed tactical bombers. In this case, the air raid turns into a complex, multi-link

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an operation during which one group of fighters "clears the air" over the target of a bombing strike, the second group blocks the airfields on which enemy fighters are based and does not allow them to take to the air, tactical bombers from a strafing flight inflict a swift strike on enemy anti-aircraft artillery positions, and only after all this, an armada of heavy bombers appears in the sky above the object, accompanied by another group of fighters. An attentive reader should have already noticed the substitution: we gradually
replaced the definition of “long-range” with a “heavy” bomber. Which, of course, is not the same thing at all.

It's just that such an organization of interaction, which is described above, was possible only when striking at the enemy's close operational rear. In fact, this is exactly how the Allies bombed targets in Northern France since mid-1941. It was much more difficult, if not impossible, to cover long-range bombers with fighters during many hours of raids into the depths of enemy territory. The same "existence equation" interfered. Physics does not know such words as "fighter" or "bomber". An aircraft with a long range
should have a relative fuel weight of about 30–35%. Taking into account the much higher (in comparison with a low-maneuverable bomber) requirements for airframe strength and engine power, the relative weight of the fighter structure will not be lower than 60-70%. What remains for the pilot and armament? In the best case - 5% of the takeoff weight. And in order for weapons, ammunition and instrumentation to “fit” into these 5%, the take-off weight of a long-range escort fighter must be at least 5-6 tons. In order for a 5-ton aircraft to be able to conduct air combat with light enemy fighters, it will need the power-to-weight ratio characteristic of a fighter, and not of a "flying barge", i.e. 350–450 hp. per ton of weight. In absolute terms, this means the need for an engine with a unit power of about 2 thousand hp. As a result of such a simple calculation, we came to a fairly accurate description of one of the most famous fighters

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escort - the American "Mustang" P-51 D: empty weight 3232 kg, takeoff (without outboard tanks) - 4581 kg, fuel weight - 800 kg, engine power - 1700 l. With. In this configuration, the aircraft had a power-to-weight ratio acceptable for a fighter (371 hp per ton of weight), but, alas, the range was insufficient to escort long-range bombers - only 1528 km. With two hanging tanks of 416 liters each, the range increased to 3700 km, the relative weight of the fuel became quite “correct”, that is, it increased to 28% of the take-off weight, but at the same time, the power-to-weight ratio decreased to the level of 323 liters. With. per ton. The Mustang turned into a full-fledged fighter only after running out of fuel and dropping outboard tanks. The D-series Mustang is 1944. In the 1930s, nothing

like this existed and could not exist, since the unit power of the best aircraft engines did not then exceed 800–1000 hp. The two leading European aviation powers, England and France, did not even make serious attempts to create a long-range escort fighter. Things were no better in the aviation of Italy and Japan. The German twin-engine "strategic fighter" Me-110C turned out to be too heavy (take-off weight 6740 kg) for two 1100 hp engines. every; the low power-to-weight ratio was exacerbated by the inevitable drawback of the twin-engine scheme - low angular roll rate due to the large separation of masses from the longitudinal axis (two engines of 700 kg each on the wings). The most important drawback was that the flight range (909 km with a supply of fuel in the internal tanks of 1268 liters) did not correspond to the task at all. True, the Me-110D variant was developed with an additional non-removable tank and a total fuel supply of more than 4000 liters, but the flight data of this monster turned out to be so low that the Luftwaffe refused such a “fighter”. Significant efforts were made in the Soviet Union to create a long-range escort fighter. The lack of a high unit power engine made it necessary to follow the "German trail", that is, to design a twin-engine fighter.

Before the war, flight tests of two aircraft began. Fighter Grushin "Gr-1" with two liquid-cooled engines AM-37

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(1400 hp) with a takeoff weight of 7650 kg had a range of 1890 km. The Tairov fighter with two M-89 air-cooled engines (1350 hp) with a take-off weight of 6626 kg had a range of more than 2000 km. However, the outbreak of war, the death of Tairov in a plane crash, the unreliability of experimental engines (neither the AM-37 nor the M-89 were ever put into mass production) did not allow the work on these aircraft to be completed. Now we can return to the discussion of

the problems of long-range bomber aviation. As we have already found out, neither Germany nor its opponents and allies in Europe had a real escort fighter. A long-range bomber that flew deep behind enemy lines had to rely only on itself, i.e. on the power of their defensive weapons and on the means of passive protection. The multifaceted concept of "passive protection" includes many different aspects. First of all - the tactics of

application, i.e. the ability to "not catch the eye" of the enemy, which was achieved by high flight altitude, by organizing raids at night, in clouds, in fog. The practice of combat use showed that losses in night raids were very low (up to 1–2% of the number of sorties). True, the accuracy of night bombing was expressed in similar numbers. In other words, night bombings only made it possible to drop a bomb load on a huge area target (a large city) aimlessly. Here we are once again faced with the amazing interconnectedness of all components of the aviation weapons system. The radar bomber sight, which appeared at the end of World War II, became - paradoxically as it sounds - the most reliable means of passive protection for a bomber, because. allowed to bomb at night, because of the clouds, but at the same time with fairly high accuracy.

At the end of the 1930s, there was nothing like this "in metal", and for effective targeted bombardment it was necessary to fly during the day, below the clouds, or even at low level flight. It

was necessary to make serious changes in the design of the aircraft, allowing it to withstand numerous hits of fragments of anti-aircraft shells and at the same time not catch fire, do not explode,

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not crumble in the air, but hold out to your airfield. We will name only the most significant technical solutions:

- the use of a multi-engine scheme that allows you to continue flying when one or even two engines fail; - refusal to use liquid-cooled engines (which fail after the first hole in the radiator or pipelines);

- the use of "self-tightening" protected gas tanks (the inner surface of the tanks lined is a multilayer "package" of rubber of various grades, while the inner layers have the ability to expand upon contact with gasoline and thus close, "tighten" holes from bullets and shrapnel); - pressurization of free volume in gas tanks and around them with inert (i.e., preventing combustion) gas (nitrogen or cooled engine exhaust gases were usually used); - reservation of the most critical units; - duplication of the most critical systems (wiring

rudder controls, hydraulics, power supply systems);

- the use of "self-released" chassis (a certain layout of the compartment allows you to release the chassis even if the mechanisms fail, only due to weight and air pressure);

- high strength and rational layout of the structure, which allows saving the life of the crew during an emergency landing on the fuselage.

All these measures did not, however, solve the problem of creating a combat aircraft capable of withstanding a direct hit by an anti-aircraft projectile or a projectile from a medium-caliber aircraft gun. There is no such protector that could "tighten" a meter-long hole in a gas tank formed by an explosion of a high-explosive fragmentation projectile of 37 mm caliber. No armored back of the pilot "held" a direct hit by an armor-piercing projectile of 20 mm caliber. An aircraft armored at least at the level of a light tank or armored car would not be able to take off into the air. True, and the probability of a direct hit by an unguided anti-aircraft projectile on a target moving at a speed of at least

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100 m / s (360 km / h), was negligible. Even if the anti-aircraft gunners determine the height, range and speed of the target with absolute accuracy, if the ballistic computer accurately determines the predicted point of guidance, and the gunner directs the gun barrel to this point with absolute accuracy; if the projectile leaves the gun barrel at a speed that exactly corresponds to the table values, the projectile most likely will not hit the target. An anti-aircraft projectile will have to fly for several tens of seconds (and the higher the bomber is, the longer this time), and during this time a small (accidental or deliberate) change in the speed and / or direction of the aircraft's flight will lead to the departure of the target from the calculated firing point by hundreds of meters. In fact, anti-aircraft artillery could only conduct barrage fire, creating a cloud of fragments in the path of the bomber.

The means and systems of "passive defense" could resist the fragments of shells. To protect a bomber from fighters armed with heavy machine guns, and even more so with cannons, is not. The fighter fires at close range (limited only by the risk of collision, i.e., about 50-100 meters). Shooting from 3-6 automatic "trunks", it is difficult to miss a bomber with a wingspan of 20-30 meters from 50 meters. A dozen direct hits from 20 mm shells or 3–4 medium caliber (30–37 mm) shells were usually enough to destroy any bomber. Accordingly, only means of active defense could give a chance for survival when meeting with enemy fighters. Without digressing to a discussion of exotic, but never included in the series of projects (anti-fighter grenades, unguided rockets,

aerosols that ignite in the air), let's immediately move on to real means of active defense, i.e. defensive small arms bombers. The best of the best was the famous American "flying fortress" "B-17". Very powerful weapons (the rear hemisphere could be fired at the same time by 4 shooters from 7 heavy machine guns, and this is not counting the two side shooters) were supplemented with more protected gas tanks, armor (27 armor plates protecting the crew and the most vulnerable units; the total weight of the armor on the latter

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modifications reached up to 900 kg), the original design of the wing, which can withstand severe damage.

"B-17"

And even all this was not enough. Two infamous raids into the depths of Germany (August 17 and October 14, 1943), when, while trying to bomb the bearing factories in Schweinfurt and Regensburg, 120 aircraft (every fifth of the "fortresses" that took part in the raid) were shot down, and almost half of the survivors needed in a lengthy repair, they convinced the American command that a long-range bomber could not bomb during the day without fighter cover. Even if you call it a "flying fortress" and equip it with a dozen large-caliber barrels. A fighter is faster and more maneuverable than a bomber; cannons fixed in its fuselage or wings can have much greater power and range; the fighter pilot himself chooses the direction and moment of entry and exit from the attack. As a result, a fire duel in a pair of bomber - fighter is most often won by the latter.

The conclusion from all that has been said is quite simple: even if the 27-ton "flying fortress" "B-17" with its most powerful weapons turned out to be "limited fit", then the 10-12-ton twin-engine "Junkers", "Heinkels", "Wellingtons" and "DB-3" all the more could not be used as long-range day bombers. Two or three firing points, equipped with rifle-caliber machine guns, could not provide any reliable protection against fighter attacks. The practical range of the combat use of these bombers was not determined by the numbers that flaunt in all the “tablets” (1700 km for the Junkers Ju-88, 2700 km for

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"Heinkel" He-111, 3300 km for "DB-3f", 4100 km for "Er-2"), and the range of escort fighters, that is, two to three hundred kilometers! This conclusion is confirmed by

the entire course of hostilities in the summer and autumn of 1941. Moscow is located at a distance of 1000 km from Brest, Leningrad - 750 km from East Prussia. According to the "tablets", the Germans could start bombing the Soviet capitals from the very first days of the war. But for some reason they refused such actions, which are extremely effective from the point of view of obtaining moral and political benefits. Massive raids on Moscow and Leningrad began only in the second half of July 1941, only after the base airfields of German aviation were near Pskov and Vyazma, i.e., at a distance of 200–250 km from the bombing target.

We began this chapter with the well-founded statement that bombers are the main form of military aviation. We will end it by stating the fact that only under the condition of reliable cover by its own fighters, a bomber of the Second World War era could effectively perform its tasks, i.e., bomb enemy targets with precision, from medium and small

heights during the day.

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CHAPTER 4 AIR WORK WARS

In the previous chapter, we discussed the tasks that bomber aircraft could perform and discussed some of the performance characteristics that were necessary for this. In this chapter, we will consider the real technical parameters of real combat vehicles. In fact, the main European powers entered World War II with three types of bombers: - twin-engine "long-range"; - twin-engine "high-speed"; - light single-engine. The quotes are

absolutely necessary. The so-called "high-speed" bombers of the 1930s very soon

ceased to be such after the new generation of fighters - thanks to the increased specific wing load - surpassed them in speed. As for the "long-range bombers", a twin-engine 10-ton aircraft could not be such in principle - no matter how far it flew. One of the reasons for this paradox was discussed in detail in the previous chapter: two shooters with rifle-caliber machine guns could not provide active protection against enemy fighters. The second reason was that one pilot physically could not provide adequate control of the aircraft for 8-10 hours, namely, such a flight duration was required in order to overcome 3000 km at a cruising speed of 300-350 km / h. To accommodate a large crew and instrumentation of solid weight on a 10-ton aircraft was not allowed by the “existence equation”.

Before proceeding to the table with technical parameters, it is necessary to give one more explanation about the terms used. An airplane is a complex thing, and everything in it is ambiguous. In a sense, each parameter has a set of values. For a bomber, at least five speeds are relevant.

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(take-off, cruising, maximum, near the ground, at maximum altitude), three "ranges" (with maximum bomb load, with a nominal bomb load, without load and weapons - the so-called "ferry range"), five "bomb loads" (at maximum and minimum flight ranges, on the external and internal sling, the maximum unit weight of the bomb), three "engine power" (takeoff, cruising, in flight mode at maximum speed). Accordingly, a detailed and correct description of the performance characteristics of a combat aircraft should

take several pages of text. And taking into account the fact that successful aircraft were produced for several years in dozens of different modifications, a whole brochure. In addition, all reference books provide data from reference samples, while in actual operation at the front airfield, flight characteristics decreased. Thus, the test results of captured German aircraft in the Air Force Research Institute near Moscow almost always showed worse performance characteristics than indicated in all books. Therefore, one should not be surprised that in too popular publications under the name, for example, “DB-3 flight range”, you can find figures that differ from each other by two to three times. The tables below are structured as follows. Specific parameters (wing loading and power-to-weight ratio) are calculated

based on the so-called "normal take-off weight" and the highest of all available engine power values. Relative weights (empty and fuel) are calculated in relation to the maximum takeoff weight. Next to the value of the maximum speed is indicated the height in km at which this speed could be reached, the flight range is given together with the mass of the bomb load corresponding to the flight to such a range.

table 2

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	Германия, 1940 г. He-111 H3	СССР, 1940 г. «ДБ-3ф»	Англия, 1939 г. «Веллингтон» MkI	Италия, 1939 г. S.M.-79	Франция, 1940 г. «LeO-45»
Двигатель, мощность, л/с.	2*Jumo-211 1200, Ж/О	2*М-88, 1100, В/О	2*«Бристоль-18», 850, В/О	3*«А-Р»-126, 780, В/О	2*«Гном-Рон», 1060, В/О
Вес макс, кг	12 500	10 153	13 608	11 160	11 398
Вес норм., кг	10 500	8 033	12 900	10 640	10 250
Вес пустого, %	60,0	55,6	63,3	59,1	66,1
Удельная нагрузка, кг/кв. м	119,3	120,4	163,3	174,4	155,3
Удельная мощность, л/с. на тонну	228,6	273,9	131,8	219,9	206,8
Скорость макс, км/час	415 / 5	435 / 6,8	390 / ?	430 / 4	480 / 4,8
Скорость крейсерская	360	340	290	367	372
Скорость у земли		344		360	365
Потолок, м	7 000	9 000	5 500	7 000	8 200
Дальность, км	2700 / 1,0	3300 / 1,0	2896 / 1,13	1900 / 1,0	2900 / 0,5
Макс. бомб. нагрузка, т	2,5	2,5	2,04	1,25	2,0
Оборонит. Вооружение	5*7,9-мм	3*7,62-мм	(4-6)*7,7-мм	3*13-мм + 1*7,7-мм	1*20-мм + 1*7,7-мм
Экипаж, чел.	5	3	5	4	4

So, what we see in Table 2. Firstly, all these aircraft have similar performance characteristics. Not the same, but similar. It is not necessary to say that some kind of car "cannot be compared with ...".

Further, our "DB-3f" (which traditional Soviet historiography invariably referred to as "obsolete") is at least as good as its competitors in terms of the entire set of parameters. First of all, it should be noted the very low weight of the structure (55.6% of the maximum take-off) and a record high power-to-weight ratio. As a result, the longest flight range and excellent rate of climb (the DB-3f gained a height of 5 km in 10.5 minutes, that is, one and a half to two times faster than any bomber). (it is possible that there is no need to send a bomber modern ability to him upstairs, but here is the

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to continue flying on one engine, which the DB-3f possessed due to its high power-to-weight ratio, is a very valuable quality of a combat aircraft. Protected gas tanks, inert gas pressurization, low-vulnerability air-cooled engines, armor protection for the pilot and gunner, high flight altitude (ceiling 9 km) - all this meant that in terms of survivability the aircraft not only met the "best world standards", but actually set them. At first glance, it may seem that the German "Heinkel" has more powerful defensive weapons. But it is not so. If the German crews consisted of many-armed people, then the abundance of machine-gun barrels sticking out of the cockpits of German

bombers would mean a great power of defensive fire. In fact, having abandoned (for the sake of reducing aerodynamic drag and gaining speed) the use of "normal" rotary turrets, the designers of Heinkel, Junkers and Dornier were forced to stick the cockpits of their aircraft with many light machine guns of rifle caliber. The shooter, having started firing at the attacking fighter from one machine gun, then had to run over to another, prepare it for firing, again “catch” the target in the crosshair of a new sight and resume firing ... Soviet designers went the other way. In the late 1930s, unified machine-gun turrets designed by Mozharovsky and Venevidov were developed. The upper MV-3 turret provided full 360-degree circular fire on the horizon. The turret cap was equipped with compensators that balance the effect of the air flow on the machine gun barrel and significantly reduce the effort required to rotate the turret. The lower (“hatch”) installation of the MV-2 had a machine gun that advanced into the stream beyond the dimensions of the fuselage and was associated with a periscope sight, thanks to which the shooter received an overview of the lower part of the rear hemisphere of the airspace.

aerodynamic

Of course, you have to pay for everything good. The high fairing of the MV-3 turret sticking out in the stream created additional resistance. As a result, such a beautiful and "streamlined"-looking "DB-3f" had a passive aerodynamic coefficient

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resistance is 8% more than the angular and clumsy Junkers-88 (respectively, 0.026 and 0.024). Nevertheless, due to the large power-to-weight ratio of the DB-3f, in all speed parameters, it fully met the standards of its time. The problems of the DB were different: a second gunner was needed, constantly working with a lower installation (this problem was already solved in the vehicles produced in the second half of 1941), and it was necessary to replace the 7.62-mm machine guns, which were ineffective against new fighters, with something more powerful (the BS large-caliber machine gun in the upper mount appeared in the DB-3f model of 1942). In this regard, it is interesting to note that the Italian Savoia Marchetti
S.M.-79, with a general archaism of technical solutions (a three-engine scheme, a truss fuselage with corrugated sheet sheathing), from the very first modifications, was armed with 13-mm Breda machine guns installed in the cockpit and ventral
gondola.

With all this, "DB-3f" was not, of course, another "wonder weapon". In many ways, he surpassed his contemporaries competitors, but in some ways he was inferior to them. Heinkel and Wellington, thanks to their large voluminous fuselages, could lift bombs of a larger unit weight and were able to take up to 2 tons of bombs on an internal sling (against 1 t on an internal sling for the DB-3f). Before the appearance of the second gunner in the DB-3f crew, defensive fire was unacceptably weak, it was simply impossible to shoot back from fighters attacking simultaneously from above and below. In this respect, enemy bombers were better equipped for active defense.

Now let's move on to a review of the performance characteristics of the so-called "high-speed" bombers. They became high-speed due to the high thrust-to-weight ratio, which, in turn, became possible due to a decrease in the relative weight of the payload (i.e., bomb) load and an increase in the relative weight of the propulsion system. Simply put - the same two engines with a capacity of 900-1000 liters. With. were placed on a plane with a bomb load half as much.

Table 3

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	Германия, 1939 г. Do-17 Z-2	СССР, 1939 г. «СБ-бис 2»	Англия, 1937 г. «Бленхейм» Mk-IV
Двигатель, мощность, л/с.	2*Bramo-323P. 1000 л/с, В/О	2*М-103, 950 л/с, Ж/О	2*«Бристоль-15», 905 л.с., В/О
Вес макс, кг	8 840	7 750	
Вес норм., кг	8 050	6 175	6 532
Вес пустого, кг	5 200	4 427	4 441
Удельная нагрузка, кг/кв. м	146,1	108,4	148,5
Удельная мощность, л/с. на тонну	248,4	307,7	277,1
Скорость макс, км/час / на высоте, км	410 / 5	425 / 4,1	428
Скорость крейсерская, км/ч	300	320	319
Скорость у земли, км/ч	342	375	386
Потолок, м	8 200	9 300	8 300
Дальность, км / при бомб. нагрузке, т	1150 / 0,5	1350 / 0,5	1870 / 0,454
Макс. бомбовая нагрузка, т / при дальности, км	1,0 / 700	1,6 / 1200	0,6
Оборонит. вооружение	4*7,9-мм	4*7,62-мм	2*7,7-мм
Экипаж, чел.	4	3	3

All this "troika" was created at about the same time: flight tests of the postal-passenger Dornier, on the basis of which the Do-17 bomber was made, began in the fall of 1934, the first flight of the Tupolev "SB" took place on 30 December 1934, the first Blenheim took to the skies on April 12, 1935. The concept of the aircraft was also common: the minimum weight of the bomb load, but at the same time high speed, which allows you to avoid meeting with enemy fighters.

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"Do-17"

The first to test this theory was the Soviet Union in the fighting of the Spanish Civil War. On October 28, 1936, Soviet SB bombers made their first sortie. Despite many difficulties (the aircraft was still very “raw”, the new M-100 engines for the Soviet industry produced no more than 20–30 flight hours, most of the crews saw the “SB” only after arriving in Spain), the bomber proved to be a very successful machine. . The reports of the pilots unanimously testified that the enemy fighters could not catch up with the "SB". In general, during the two years of the war in Spain, "SB" carried out 5564 sorties.

"Blenheim"

The level of losses was quite low: 50-60 sorties per shot down aircraft, the average combat life of the machine was almost six months (172 days). The main problem was the absence of protected gas tanks on the first modifications of the "SB" - the main losses of the "SB" were from a fire in the air; there were almost no cases when the car was shot down, killing the pilot or damaging the controls.

Rich combat experience (except for Spain and Finland, "SB" managed to make war in the skies of China and Mongolia) was taken into account in the course of numerous

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modifications of this most massive bomber of the Soviet Air Force. Launched into production in 1939, the SB-bis 2 had gas tanks protected “in full” (multi-layered rubber protector and pressurization with inert gas), standard MB machine gun mounts, armor protection for the pilot and gunner. The armament was significantly increased: the maximum bomb load increased to 1600 kg, and the aircraft could take three 500-kg FAB-500 high-explosive bombs. At the same time, thanks to the installation of more powerful M-103 engines, it was almost possible to maintain the maximum speed at the level of earlier and lighter modifications - but this no longer helped to preserve the glory of a “high-speed” bomber for the SB.

"Messerschmitt" 1939 ("Bf-109" E1) developed a maximum speed of 548 km / h at an altitude of 4.5 km and 462 km / h at the ground. In other words, it outperformed the "SB" and "Blenheim" by 120-90 km / h in the entire range of heights of real combat use. The chances of salvation were not the best for the German "high-speed" bomber "Do-17 Z". The English Spitfire Mk-I (speed near the ground 470 km / h, maximum at an altitude of 5.5 km - 582 km / h) also overtook the Dornier by 150-120 km / h. The miracle didn't happen. After the designers of fighters went to a significant increase in the specific wing loading of their new aircraft, the very idea of a light bomber capable of overtaking a fighter died hopelessly.

Table 4 can serve as a simple and convincing illustration of this conclusion. It shows

the share (as a percentage of the total number) of three types of aircraft in the German bomber aviation on three dates: the beginning of World War II, the start of the Wehrmacht offensive on the Western Front against France and its allies, the invasion of the USSR (only the composition of the bomber groups sent to the Eastern Front is indicated).

Table 4

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	1.09.39	10.05.40	22.06.41
«Дорнье» Do-17	32	27	11
«Хейнкель» He-111	67	58	31
«Юнкерс» «Ju-88»	1	15	58
Всего самолетов	1 171	1 816	911

Table 4 deserves close attention. First, one can see a clear disappointment in the concept of a light "high-speed" bomber - the share of "Do-17" in the total aircraft fleet of German bomber aircraft is steadily declining. The Germans realized that it makes no sense to spend two engines, four tons of duralumin and four trained crew members in order to get an aircraft with a carrying capacity two to three times less than that of the Junkers. Secondly, it is clearly seen that the Luftwaffe fought back the

first two years of the war on such bombers, which, in terms of Soviet historiography, should be called "aircraft of the old types." In the summer of 1940, at the height of the air war in the West, German bomber aircraft were 85% armed with Heinkels and Dorniers, which on the whole were no better than the Soviet DB-3fs and SBs. The dynamics of losses of Luftwaffe bombers during the "battle for England" in the summer and autumn of

1940 is also quite remarkable. From the beginning of July to the end of September (that is, in the most critical halyard of the battle), German bombers made 9,700 sorties during the day and 7,150 at night. At the same time, combat losses (excluding accidents) amounted to 507 and 36 aircraft, respectively. In other words, one downed aircraft accounted for 19 sorties during the day and 199 at night! And this despite the fact that both day and night the Luftwaffe bombers performed the same task: they took off from airfields in Northern France, crossed the English Channel and bombed large stationary objects. The tenfold difference in the level of losses was determined only by the difference between a bright day and a dark night, reliably sheltering the bomber from fighter attacks. Thus, we return to the conclusion that was already formulated

above: any bomber of the beginning of World War II

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war was "the plane of the clear (or night) sky." Meeting with a stubborn and courageous fighter screen inevitably led to huge losses. Huge, since the loss of one aircraft per 19 sorties in a high-intensity air war (1 sortie per day) means the complete loss of the entire original aircraft fleet in less than one month. No industry can make up for such losses, that is, completely re-equip its aviation once every twenty days.

At the end of the chapter, it remains to say a few words about light single-engine bombers. They do not deserve more, since the very concept of a "small and cheap" combat aircraft was initially absurd. If 8-10 tons of take-off weight of "normal" twin-engine bombers was not enough to accommodate all the weapons and equipment necessary for combat, then what could be done with an aircraft in which the share of the payload (crew, weapons, devices) remained less than 1000 kg? And how far will a single-engine bomber fly after the failure of its only engine? And where can you physically place a navigator-scorer in the cockpit of a single-engine bomber? In some ways, the idea of "Ivanov" (as Stalin himself allegedly called the program to create an air fleet of 100,000

single-engine bombers) subtly resembles the much more famous idea of Chairman Mao about building a blast furnace in every Chinese village. As you know, a great many furnaces were built, and a lot of iron ore was used for these wild experiments ... Strange, but a single-engine microbomber was built not only in the country of the Elder (in relation to the Chinese communists) brother, but also in good old England. The single-engine bomber "Battle" (Battle) (5 tons of take-off weight, crew of 3 people, bomb load of 454 kg with a flight range of 1610 km) was put into serial production in 1937, and they were made

in three years (including training machines) 2185 pieces. In 1940, two hundred "Battles" took part in the May battles in France, where they suffered terrible losses from "Messers" and German anti-aircraft guns. This was the first and last episode

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mass combat use of "Battles". In the future, this (by the way, amazingly elegant) aircraft was used to patrol the sea coast and as a training vehicle.

The Soviet Su-2 (4.4 tons of takeoff weight, crew of 2, normal bomb load of 400 kg with a flight range of 1190 km) was made later (serial production began in 1940) and made better. It flew faster (maximum speed 467 km / h versus 406 km / h for the Battle), was equipped with a more tenacious air-cooled engine (the Battle had an in-line liquid-cooled Merlin engine), the tanks were protected and equipped with a pressurization system inert gas. In skillful hands, the Su-2 really showed miracles of survivability. So, the 135th

BAP carried out 630 sorties from September 25 to November 1, 1941, without losing a single aircraft! In the summer of 1942, the Su-2 bombers from the 270th BAD (bomber air division) carried out 80 s / a before decommissioning, while the more modern and high-speed Pe-2s only 20, and the American Bostons in neighboring 221st dietary supplement - a total of 19 s / v. (82)

But these are all out of the ordinary examples. On average, everything was much worse: in 1941, the Su-2s completed 5,000 s / v, while 222 aircraft were shot down by the enemy (22.5 sorties per combat loss). The weak and weakly armed aircraft had no practical combat value, and its production was stopped already in 1942 at the level of 877 pieces - on the scale of Soviet military production, one might say, they had not yet “begun making it”.

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CHAPTER 5 BATTLE FIELD PLANES

The design of combat aircraft, which was discussed in the previous two chapters, began in 1934-1935. Most often, these were hastily converted commercial aircraft (this is how the Heinkel He-111 and Dornier Do-17 appeared) or machines turned into a bomber, designed at one time to set another record (this is how the DB-3 and "Dornier" Do-17 appeared). Blenheim). And although the descriptions of the history of the development of any pre-war aircraft begin with a mention of a certain technical task or “specification”, these tasks themselves appeared on the basis of aviation fantasies of the past decade, or even simply “tailored” to the designs available to the contractor.

Serious changes began after the war in Spain. And this is understandable - there was a real experience of combat use, there were new requirements based on this experience. In this connection, two works are worth mentioning. In 1938, with the note “for the commanding staff of the Red Army”, the book of the German Navy officer, Dr. G. Klotz, “Lessons of the Civil War in Spain”, was translated. (84) Analyzing Air Combat Operations, Klotz

writes:

> “... The capabilities of the aircraft are just as far from the utopian views of the supporters of the theory of “independent air warfare”, as well as from the strict dogmas of the conservatives, assigning to the aircraft only a modest role of a secondary, auxiliary weapon ...
>
> ... We must not allow either underestimation or, especially, overestimation of the capabilities of aviation ... we must admit that the assertions of such fanatics as Goering that the war can be ended in a few hours ... The air war in Spain showed that its final outcome will be decided by ground forces, not aviation ... "

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In the following year, 1939, under the editorship of the head of the combat training department of the Red Army, brigade commander S.I. Lyubarsky published a monograph "Some operational tactical conclusions from the experience of the war in Spain." The book began with a very remarkable phrase: ***“The fighting on the Spanish sector of the second imperialist war is over” (it*** is worth noting that Klotz concludes his study with almost the same words: ***“on Spanish territory, the first battles of a new European war are going on, which, without any announcement in the mind, is in full swing ").*** Among the many problems

dealt with in this monograph, a large place is given to the role of aviation as a means of direct support of troops on the battlefield ***(“it is especially necessary to single out and emphasize the issue of using aviation in combined arms offensive combat. Since this issue has been the most discussed and is still underway disputes").*** A definitive and indisputable answer "on this question" has never been received; in any case, a serious discussion of it goes far beyond the scope of a review chapter. But to clarify the meaning and content of the question will be absolutely necessary.

The question is not whether it is good to drop a bomb on the front line of the enemy's defense. In war, very good. The question is different - what kind of bomb and by what means? Practice has shown that most of the targets on the battlefield (manpower of the enemy, light field shelters, artillery firing positions, vehicles and artillery tractors) are confidently hit by a 50-kg aerial bomb. Larger caliber is not required. It is interesting to note that the economical Germans did not have a “weave” at all, and the next caliber after the 50-kg bomb was a 250-kg bomb. In service with the Red Army Air Force "weaving" ("FAB-100") was, however, the practice of the 41st year showed the redundancy of such ammunition to hit targets on the battlefield. At the beginning of 1942, the issue of removing the "weave" from service was even discussed (although, in fact, they went the other way, and in the dimensions of the "FAB-100" a powerful high-explosive fragmentation bomb was developed, the heavy fragments of which theoretically should have

hit lightly armored vehicles). But in order to bring down a 50-kg ammunition on the head of the enemy, it is not at all necessary to drive an expensive aircraft. Approximately the same weight (40-45 kg) have the main types

howitzers ("six-inch"). And now let's count a little. A squadron (12 aircraft) of Pe-2 dive bombers is lifting 120 FAB-50 caliber bombs. Yes, the calculated “carrying capacity” of the Pe-2 is much higher, but bombs cannot be “poured” into the bomb bay, like gasoline into a fuel tank. The maximum bomb load is limited by the number of hardpoints and the design of the bomb racks; more than 10-12 units of bombs ("Pe-2" or "SB") could not be taken.

A battery (4 guns) of 152-mm howitzers will fire the same 120 rounds in 15 minutes. The next 120 shells are in the next 15 minutes. Without much overvoltage of guns and crews. The 1941 standard of the year “ammunition consumption on a day of intense battle” (there is such a thing in artillery) established the consumption of 72 152-mm howitzer shells per gun. Moreover, this is a “supply” standard, not a technical one - within one day, with breaks to cool the barrel, one howitzer could shoot hundreds of shells ... Add to this the fact that the howitzer fires when needed, and the planes of the 40s bombed when it was possible - during the day, in good, sunny weather. A huge advantage of aviation is the ability to use heavy ammunition: even a light "SB" lifted the "FAB-500", while a

cannon firing projectiles of this weight (305 mm caliber naval gun) weighs hundreds of tons, and move on land if and maybe only on a special platform. railway However, ***"combined arms offensive combat"*** simply does not have targets that require the "FAB-500" to defeat. The second indisputable advantage of aviation is the range of ammunition delivery. The small "under-bomber" "Su-2" (more than 500 km - guns with a had a range range of at least one-fifth of this V number simply do not exist (we will not be distracted by the discussion of "big Berts" and other, monstrously expensive and unreliable, artillery exotics). But the defensive zone of an infantry regiment or division does not have such depth. The most massive 152-mm howitzer of the 1938 model had a firing range of 12.3 km; much heavier (weight in combat position 7.13 tons) and expensive 152 -mm gun-howitzer "ML-20" threw 43-kg

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projectile at a range of 17.2 km. In principle, this was enough to defeat any point of the enemy's tactical defensive zone. As you can see, the question of the advisability of using aviation

in combined arms combat is not at all simple. With a sense of legitimate pride in Soviet military science, we note that in Lyubarsky's book fairly balanced conclusions were given; the main advantage of battlefield aviation over cannon artillery was also noted:

> “... Without massing aviation on the battlefield, no offensive operation in Spain would have been successful. Only due to the fact that aviation, acting on the battlefield, supplemented artillery with its bombardment, and when the defender retreated, they fell on him and, as it were, performed the role of air artillery and cavalry, were successes in offensive operations possible ... Any war is purely specific ... In the presence of a large amount of artillery and tanks, the latter can perform most of the tasks on the battlefield that aviation was supposed to perform in Spain ... ... Aviation was a powerful maneuverable reserve of the High Command, which it could throw at any moment on any site (highlighted by me. - M.S.) ... Air forces in their bulk quickly
>
> appeared on the decisive sector of the front and, together with combined arms formations, decided the fate of the battle. This
>
> is a new and very important element in relation to
>
> use of aviation ... "

At any moment, to any sector ... In this and only in this aspect, aviation was decisively superior to field artillery. The howitzer in the Soviet artillery regiments was transported by a caterpillar tractor or an ordinary tractor. Towing speed - no more than 10-20 km / h (in the infantry division of the Wehrmacht, six horses dragged a 150-mm howitzer - at an even lower speed). The bomber flies 20 times faster, and this made it possible in a matter of hours and minutes to concentrate the required number of aircraft at a given point and

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literally "plow" a narrow section of the enemy's defensive line. Neither artillery nor tanks had such an opportunity for operational maneuver and concentration of forces in the right place at the right time. From all of the above, one

indisputable conclusion can be drawn - the effectiveness of the use of battlefield aviation is to a large extent determined by the tactics of use, the skill of commanders, and the impeccable organization of communications and interaction between headquarters and troops. If all this is available, then an aircraft with very mediocre flight characteristics can become a terrible tool for a “blitzkrieg”. It was this kind of combat fate that awaited the German Junkers Ju-87 dive bomber, which became one of the most effective combat systems of World War II.

A clumsy, angular, "chopped with an ax" plane with ridiculously sticking out legs of a non-retractable landing gear in huge fairings (for these fairings it received the nickname "lapmaker" in Russia) could be a worthy contender for the prize "the ugliest aircraft of the century." The first serial version (“Ju-87” A) with a bomb load of 250 kg developed a maximum speed of only 292 km / h - how could one not call such an aircraft “hopelessly outdated”? On June 9, 1936, Colonel von Richthofen - head of the design section of the Technical Department of the Ministry of Aviation - issued an order to stop all work on the Ju-87. The next day, Richthofen was replaced by Ernst Udet, an ardent admirer of the "lapmaker", who immediately canceled the order of his predecessor. However, even after that, the serial production of Junkers "went, as they say," per hour for a teaspoon. In two years (1937–1938), only 395 cars were produced. In 1939 (the first year of World War II), 557 Ju-87s were delivered to the Luftwaffe. Everything is relative. In the same 1939, the Soviet Union, in the process of “peaceful creative labor”, produced 1778 “SB” front-line bombers ... Only a very careful look could notice the main advantage of the “lapmaker” - brake aerodynamic grilles (a unique

unit in aviation, where everything is subordinated to the task of achieving maximum speeds), pressed in a parking position to the wing, gave out a dive bomber in this aircraft.

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The essence of the idea was very simple. At a dive speed of 150–200 m/s, the bomb was actually “fired” at the target, and at a speed quite comparable to the muzzle velocity of an artillery shell. With a completely sheer (at an angle of 90 degrees to the ground) dive, all ballistic calculations became unnecessary - the bomb rushed to the target almost in a straight line. Of course, a real dive took place at lower speeds, with smaller angles, and the calculation of lead was necessary - and yet the dive aircraft provided an incomparably higher accuracy of bombing. Piloted by an experienced and physically hardy pilot (the overload at the exit from a dive reached 5–6 units), the dive bomber could lay a bomb in a circle with a radius of 30 meters!

This is not great, but fantastically high accuracy. For an ordinary "horizontal" bomber, even in a calm environment of the training ground, getting into a circle with a diameter of 200-300 meters was considered an excellent result. In battle, with poor visibility of the target, under fire from anti-aircraft guns, the accuracy of bombing became even lower. So, G. Klotz in the book mentioned above writes: ***“The bombardment was not successful on either side, or at least did not achieve the expected results when its objects were less than 500 or 600 m long and 150 to 200 m wide. The bombardment of bridges south and southwest of Madrid, or of batteries in position, gave almost entirely negative results even when it was carried out from a height of several hundred meters ... "***

The exceptionally high accuracy of bombing turned an aircraft with a very modest bomb load (the Ju-87 of series B carried four 50-kg bombs on underwing holders and one 250-kg bomb under the fuselage on a special "rocking chair" that takes the bomb beyond the plane of rotation of the propeller) into very efficient combat vehicle. The dive bomber also created enormous difficulties for the enemy anti-aircraft gunners. It was almost impossible to hit a target, the height and speed of which is constantly changing, with the sights of that time, and setting up an effective barrage was complicated by the fact that the dive bomber could at any moment change the slope of his trajectory and leave the affected area.

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The idea of dive bombing is simple, and its merits are obvious. It was not at all easy to create an aircraft capable of realizing this idea. Taking an aircraft out of a dive (i.e., moving at high speed in a circle of small radius) causes enormous g-forces, and the unusually high speed of a dive flight can lead to the destruction of the wing due to aerodynamic vibration (flutter). In order to limit the dive speed to the limit acceptable for reasons of strength and aiming capabilities, it was necessary to artificially increase the aerodynamic drag - a completely unusual task for aviation. They solved it, as a rule, by installing on the wing (or fuselage) special brake grids that deviate during a dive. This led to the following train of problems: the air brakes came off, tore the attachment points, violating the stability and controllability of the aircraft, and at the most crucial moment of the flight.

Only a very strong and rigid airframe design, more typical for a fighter than for a bomber, could withstand such loads. Increased structural strength is extra weight, therefore, based on the “existence equation”, something (the weight of fuel, the weight of weapons) had to be sacrificed. In other words, a dive bomber will always be inferior in performance characteristics to its "horizontal" peers. Further, practice has shown that a pilot who is losing consciousness from overload will not be able to independently bring the aircraft out of a dive. There was a need to develop a reliable device for automatic withdrawal from a dive, which, at the level of development of technology in the 30s, was a task of unprecedented complexity. These (and many others not mentioned here) problems were

successfully solved by the Junkers designers during the development and modernization of such an awkward-looking aircraft. Clearly giving preference to strength-material over aerodynamics, German engineers created an exceptionally strong design, which made it possible to continuously increase the weight of the payload. Launched into production in the spring of 1941, the Ju-87 of the D series could already take a 1000-kg bomb to the central rocking chair (one hit of such a bomb sent the battle cruiser Marat to the bottom of the Kronstadt Bay).

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Fortunately for Germany's opponents, the low-speed (even with a 1400 hp engine, the speed of the Ju-87 of the D series never exceeded the 400 km / h mark) bomber still caused great doubts among the leading ranks of the Luftwaffe. In 1940, only 611 dive Junkers were produced. In January 1941, the monthly production reached 70 aircraft, but in the autumn of 1941, at the height of the battles on the Eastern Front, the production of the Ju-87 began to be reduced again. In September, 12 (twelve) aircraft were produced, in November - two! In total, for the whole of 1941, the Luftwaffe received only 476 Ju-87s. However, even with such a modest number, the accursed "baptist" did a lot of trouble on Soviet soil ...

The Il-2 attack aircraft, which became the main “battlefield aircraft” for the Soviet Air Force, was created much later (the prototype TsKB-55 aircraft made its first flight on October 2, 1939, while testing of the Ju-87 prototype began as early as in September 1935) and in terms of technical excellence was an incomparably more modern aircraft. Rapid "streamlined" shape, retractable landing gear, top speed over 400 km/ h. Four key "technologies" made the creation of the Il-2 possible: the AM-38 engine, the stamped double-curvature armor panel, the V-23 cannon, and the RS-82/RS-132 unguided rockets.

At the time of the start of the development of the TsKB-55 attack aircraft (the future Il-2), the most powerful liquid-cooled engine in the USSR was the AM-35 engine created by the design bureau of A. Mikulin (take-off power 1350 hp). At that time, there was no serial aircraft engine of such a unit capacity in any country in the world. On the basis of the AM-35, the Mikulin Design Bureau developed the AM-38 low-altitude engine. At a boost pressure of 1.43 atm. the new engine had record-breaking characteristics for its time: take-off power of 1600 l / s, cruising power near the ground of 1410 l. s, specific gravity 0.54 kg/hp The engine of large unit power with a low specific gravity became the “magic wand” that made it possible to create a heavy armored aircraft that outperforms the English Battle, devoid of any armor (see Table 5).

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Table 5

	Вес взлетный, т	Дальность, км	Макс. бомбовая нагрузка	Максимальная скорость, км	Скорость у земли км/час
«Ju-87» B-2	4,34	590 / 0,5 т	1,0 т	380 / 4,1	338
«Ил-2» (обр. 1941 г.)	5,79	638 / 0,4 т	0,4 т + 8*РС-82	426 / 2,4	396
«Бэттл» Mk-1	5,31	1610 / 0,45 т	0,68 т	406 / 4,6	338

Unlike the design of experimental attack aircraft of the 1930s, the armor in the IL-2 was not hung (like the armor of a medieval knight) on the power frame of the fuselage, but was included in the design as the main power element. This is what made it possible to reduce the weight of the partially armored fuselage to an acceptable level. The solution, quite obvious at first glance, became possible only thanks to the enormous achievement of Soviet metallurgists, who developed highly plastic AB aviation armor and the technology of its hardening and stamping. Without going into technical details, we immediately note the result: a finished double-curvature armor panel came out from under the stamp, with exact dimensions, which did not require any additional machining. Fifty such panels (from 5 to 8 mm thick) were assembled into a single three-dimensional structure, just as the bricks of a dome, resting against each other, create a single strong vault. Such a vault in the Il-2 was the main power element

of the fuselage, inside which and on which an engine with a propeller gearbox, two gas tanks, an oil tank, a cooling radiator, and a cockpit were installed. The only vital unit that went beyond the armored hull was the oil cooler, but it was also equipped with an armored shutter, which the pilot closed when approaching the target. Not only did the AB armor have unique technological properties, it was also 1.5 times superior in bullet resistance to German-made aviation armor, which was practically established during field tests at the Research Institute of Aviation Arms in 1942. The German battlefield strike aircraft (Junkers Ju-87) was a dive bomber. "IL-2" was designed as a "attack aircraft", which in terms of that era meant a

combat aircraft,

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striking the enemy with small arms fire, weapons that were minimally sufficient for this purpose had to be created - aircraft machine guns and 20-mm cannons, which were in service with aircraft from all countries of the world, were weak for such work.

The 23 mm Volkov-Yartsev VYa-23 cannon was developed in 1940 as a weapon against protected ground targets. Very bulky by aviation standards (length 2.15 m, weight 66 kg), the gun accelerated a projectile weighing 200 g to a speed of 900 meters per second. In comparison with these parameters, the cannon of the Swiss company Oerlikon MG-FF, which was in service with German fighters, looks like an eared Zaporozhets against the background of the six hundredth Mercedes (the initial kinetic energy of the projectile is four times less than VYa-23). The powerful gun was so ahead of its time that after the war, self-propelled anti-aircraft guns were designed for ballistics and the VYa-23 cartridge, which are still in service with many armies of the world to this day (!!!). For all its undoubted merits, the 23-

mm cannon for hitting area targets (the enemy’s nodding force dispersed on the battlefield) was practically unsuitable - the fragmentation effect of a projectile equipped with only 10 g of explosives was negligible. Not much more effective was the use of bomb weapons. Four bombs (caliber no more than "FAB-100") could only be dropped from level flight (there were no devices for launching bombs beyond the plane of rotation of the propeller, and the overweight design of the armored vehicle would not have withstood a steep dive). Pilots called the PBP-1b sight installed in the cockpit in front of the windshield of the Il-2 "a device that hits the pilot once painfully." The humor was dark. During a forced landing, the sight crippled the pilot to death, while in flight it worsened the already poor visibility inherent in any single-engine aircraft. The pilot practically could not use the sight for its intended purpose for the same reason - poor visibility down.

From the point of view of the possibility of using bomb weapons, the single-seat Il-2 was inferior to any aircraft whose crew included a navigator, from whose cockpit it was possible to observe the ground (for example, the Su-2). As a result, already on August 24, 1941, an order was issued, according to which the PBP from the "silts"

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removed, and the bombing should be carried out according to the "sighting marks" on the engine hood. What does it mean? In concrete terms, the accuracy of bombing with the IL-2 was as follows. In polygon conditions, without enemy opposition, when dropping 4 bombs from horizontal flight at an extremely low altitude of 50 meters, the probability of at least one bomb hitting a 20 × 100 m band (this can be imagined as a section of a wide highway with several cars or a firing position of an artillery battery) was only ... eight percent! The problem was solved by the use of fundamentally new,

missile weapons. The dramatic history of the creation of rocket artillery in the USSR (the legendary "Katyusha") is described in sufficient detail in many books. Let us recall only the main milestones. In the early 1930s, the first successful launches of solid-propellant rockets were made. Fuel (a mixture of pyroxylin with TNT) was molded in the form of round "checkers" with a diameter of 24 mm. Seven or nineteen of these "checkers" fit into cylindrical combustion chambers, thus predetermining for many years to come two calibers of Soviet rocket projectiles: 82 mm and 132 mm. The first launches of PC-82 missiles from a fighter were carried out in 1935. As a result of many years

(interrupted by arrests and executions of designers and scientists) efforts to improve the rocket and develop mass production technology, the RS-82 and PC-132 missiles were adopted by the Soviet Air Force, respectively, in 1937 and 1938. Eight PC-82 shells or four PC-132 shells suspended under the wings of the Il-2 turned the attack aircraft into the "black death", as the Wehrmacht soldiers called it. On January 7, 1941, the Il-2 attack aircraft (even before the start of state tests!) Was launched into serial production at four aircraft factories at once. Despite the frantic race

with the adoption of "silt" into service with the Soviet Air Force, the tests were successful, without serious accidents. This alone speaks of a very high level of engineering culture of Ilyushin Design Bureau specialists. In the course of factory, state and military tests (“military tests” took place in the 4th assault air regiment already in the conditions of the outbreak of war with Germany), they revealed

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another important advantage of "silt", without which it would not have become the most massive combat aircraft in the history of world aviation. - excellent aerobatic characteristics. ***“It does not fall into a tailspin during uncoordinated turns, it flies steadily in a straight line even with abandoned control, it sits down by itself. Simple as a stool, ”*** the test pilots described the new aircraft with these words. (48) Without a doubt, the

IL-2 was a successful combination of many revolutionary technical solutions. It is much more difficult to assess the real combat effectiveness of this aircraft. The history of the Il-2 was overgrown with many absolutely fantastic legends - starting with the "soldier's truth" about how the "silt" at low level flight chopped the German infantry with propellers, and ending with articles still found in authoritative publications that "an excellently trained ***pilot subject to a successful approach to the target from a distance of 300-400 m, he hit an average of two tanks ... ".***

The harsh reality of the war was not so clear cut. Yes, the aircraft was produced in huge numbers (35668 units for the entire duration of the war - compare this with the scale of the release of the “lapmaker”) and became the main “air worker of the war”. The contribution of this aircraft, its creators and pilots, to the victory over the enemy is enormous. The price is no less huge - the combat losses of the IL-2 (namely, combat losses, not counting accidents and catastrophes, not counting depreciation write-offs) during the war amounted to 10,759 aircraft. The figure is colossal, it exceeds the number of losses of bombers of all types combined. Throughout the war, the losses of Il-2 attack aircraft (expressed as a percentage of the number of sorties) were the highest among all types of

aircraft of the Soviet Air Force. We have to admit that the rumors about the “invulnerability” of the IL-2 are greatly exaggerated. The armored box "silt" reliably protected only from the fire of infantry weapons and fragments of anti-aircraft shells. A direct hit from an anti-aircraft shell, of course, pierced such armor. It is necessary to take into account the fact that the tail section of the fuselage and the wings of the Il-2 had no armor. The wing consoles were wooden with plywood sheathing, the tail section of the fuselage was a “shell” glued from wood veneer. The queue of rapid-fire anti-aircraft guns or the fire of German air guns

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the fighter literally "cut off" the wooden tail from the steel armored box with the pilot.

Even more far from reality are the "hunting stories" about the defeat of German tanks by the fire of Soviet attack aircraft. In 1942, the Operations Directorate of the Main Staff of the Air Force established indicative "norms of combat capabilities" of the Il-2 attack aircraft, according to which 4–5 Il-2 aircraft were required to destroy one light tank, and to destroy one medium tank of the Pz type .IV, Pz.III or StuG-III self-propelled guns - at least 12 sorties. These numbers should not

be surprising. Getting from an airplane to a point target is not at all easy. During field tests (that is, in the absence of enemy opposition), ***“three pilots of the 245th ShAP, who had combat experience, were able to achieve only 9 hits on the tank with a total ammunition consumption of 300 shells for the ShVAK cannons.”*** The attack aircraft attacked the tank in a very gentle (at an angle of 10-20 degrees) dive, and even in the event of a direct hit, the shells almost always ricocheted. The same field tests at the Research Institute of Aviation Arms showed that in order to reduce the likelihood of a ricochet, it was necessary to dive on a tank at an angle of 40 degrees or more and open fire from a distance of no more than 300 meters. But under such conditions, 3-4 seconds remain before the collision with the ground, during which you need to aim, open fire and exit the dive. Such aerial acrobatics was, of course, inaccessible to medium-skilled combat pilots.

The armament and the tactics of using the Il-2 due to it required flying at low altitudes, and even at low altitude (30–50 m), and performing many approaches to the target (the aiming points, taking into account the lead for machine guns, cannons and RSs, were different , and it was impossible to conduct aimed fire simultaneously from all types of airborne weapons). Simply put, the “silts” hung over the front line for tens of minutes, attracting the fire of everything that could shoot. Alas, it was not possible to tempt fate for a long time, and the next hole became the last. The German Ju-87 dive bomber, although it did not initially have any armor (minimal armor protection elements appeared only on the D series), left the dive at the height at which the IL-2 was just starting the attack. In addition, the speed of the low-speed "Ju-

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87" at the exit from a dive, one and a half times the maximum speed of the "silt" in horizontal flight near the ground. As a result, it was extremely difficult to hit the Junkers with anti-aircraft fire. At the end of the chapter, it remains only to state that the dispute about the optimal appearance of the battlefield aircraft has remained unresolved.

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Chapter

6 THE BEST

On October 25, 1939, a representative state delegation of 48 people headed by Tevosyan (People's Commissar for the Shipbuilding Industry of the USSR) left Moscow for Berlin to collect the latest German military technologies. This delegation also included a new Stalinist "nominee", the then chief adviser to the leader on aviation issues, 33-year-old A. Yakovlev. In his famous memoirs, Yakovlev writes:

> “... He (Colonel-General Udet, Deputy Minister of Aviation of Germany) immediately stated that, on the instructions of Goering, he would show us all the aircraft, engines and pieces of equipment in service with the German Air Force. To begin with, he proposed to demonstrate German technology on the ground and in flight at the airfield ... then drive through the aircraft factories of Junkers, Heinkel, Messerschmitt, Focke Wulf, Dornier; to see the designers there; choose what we want to buy ... We started to inspect the exhibited aircraft. We were given their tactical flight data, features of weapons and equipment ... However, our General Gusev was overcome by doubts: the Germans could not show us the actual level of military aviation equipment ... To be honest, I was also embarrassed by frankness when showing the most secret area of \u200b\u200bweapons ... "

(86)

It was possible not to be embarrassed - Hitler, who had fallen into the trap of the Attack Pact, was ready to give his last brown shirt for Stalin's non-interference in his (Hitler's) European affairs alone. But Stalin did not need his shirt - so he had to pay for "friendship and peace on the eastern border of the Reich"

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sale of the latest military equipment. However, none of the Soviet comrades actually "embarrassed." On the contrary, they climbed into all the "holes", dragged everything (samples of metal shavings, paints, explosives) that is bad, demanded with a scandal "that aircraft and other ***weapons be supplied with all devices exactly in the form in which the German army receives" .*** Moreover, without a shadow of embarrassment, they told Goering that ***“we do not want to cover the current needs of the Red Army with these aircraft, but we take them as samples for review*** (that is, they honestly warned that they were engaged not in trade, but in military-industrial espionage. - ***M .S.) with German technology”.*** And what did Goering, the noble Goering, forever swollen with self-satisfaction, answer to this? He swallowed all the “pills” and asked ***“to pass Comrade. Stalin the following three requests: the first - to speed up the shipment of grain, the second - to speed up the shipment of petroleum products, the third - to speed up the shipment of metals, in particular***

nickel. (87, pp. 198-200) Yes, Comrade Stalin was able, he was able to put his allies in the "position" he needed ... Let us return, however, to aircraft. Soviet procurement and reconnaissance delegations visited Germany three times (in October 1939, March and November 1940) and eventually selected 36 aircraft of 12 different types for purchase. It is noteworthy that neither the "Heinkel" "Ne-111" nor the "Junkers" "Ju-87" (i.e., the main bombers of the Luftwaffe at that time) were not honored to be included in the list of 12 types of aircraft - A. Yakovlev and his colleagues no longer saw anything interesting and worthy of study in them. It is also noteworthy that after each trip to Germany, Yakovlev was called directly from the station to Stalin, who was worried about the same question: is the German aviation armed with such obsolete aircraft or are the hospitable hosts hiding their true achievements from Soviet friends? Apparently, the fable about the “huge technical superiority of German aviation” had not yet been composed at that time. Nevertheless, among the aircraft purchased was a bomber that deserved the closest attention. It was a Junkers Ju-88.

If the Ju-87 was originally developed by Junkers as a dive bomber, then the Ju-88 appeared in response to

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the terms of reference of the German Ministry of Aviation, which announced in the spring of 1935 a competition for the creation of a "schnell bomber" with a maximum speed of at least 500 km / h. In September 1937, the third prototype of the future "Ju-88" during flight tests even exceeded this speed (which is not surprising, given the huge specific wing load of the new aircraft for that time - 190 kg / sq. M), but to At that time, the leadership of the Luftwaffe set the main task not of a hopeless attempt to overtake the latest fighters, but of ensuring the possibility of dive bombing. Combining these requirements (high speed and the ability to dive bomb) is not at all easy, since they largely contradict each other. Low aerodynamic resistance leads to unacceptably fast acceleration during a dive, and powerful air brakes (on the Junkers, these were lattice plates fixed on the lower surface of the wing, which deviated across the air flow when going into a dive) create problems with the aircraft's controllability. A full-fledged bomber needs a large bomb bay, and therefore a large bomb bay, which, in terms of strength, is a huge hole in the most highly loaded area of the fuselage. It is very difficult to provide such a design with the ability to withstand overloads when exiting a dive (in the “clean” Ju-87 dive bomber, the entire bomb load was placed on the external sling, and the power circuit of the fuselage was not disturbed by the bomb bay cutout).

The resolution of all these technical problems took several years from the specialists of one of the oldest aircraft manufacturing companies in the world and was accompanied by a continuous series of accidents and disasters (the first prototype of the Ju-88 crashed three months after the first flight, and all 10 of the first production aircraft produced at the plant in Brandenburg, crashed in accidents related to the unsatisfactory operation of the landing gear system). Nevertheless, in the end, an aircraft was created, launched into a large series and put into service with the Luftwaffe, which, without a doubt, was the best front-line bomber at the beginning of World War II. When the World War ended, it turned out that

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"eighty-eighth" and its further modifications became the most massive twin-engine combat aircraft of this war.

The best "Junkers" was not due to its flight parameters - they were high, but by no means record-breaking (the French "LeO-45" flew a little faster, the Soviet "DB-3f" - further, and the "hopelessly outdated" "SB" - higher). The Junkers Ju 88 was superior to its contemporaries in the main thing for which an attack aircraft is created: in the number and variety of bomb weapons, in the possibilities of using these weapons.

Inside the huge bomb bay, 28 high-explosive fragmentation bombs of 50 kg caliber could be hung, four more bombs of up to 250 kg caliber were hung on underwing bomb racks. In total - 32 bombs, which ensured exceptional effectiveness in defeating dispersed area targets (in other words, enemy soldiers on the battlefield). At the same time, to destroy especially strong objects (bunker, heavy armored ship) in the Junkers bomb bay, it was possible to place a high-explosive bomb "SC-1800" (length 3.5 m, diameter - 0.66 m, weight - 1800 kg) . True, only bombs mounted on underwing holders (4 * 250-kg or 2 * 500-kg) could be dropped from a steep dive. Inside the fuselage bomb bay, there were no devices for launching bombs into the air stream during a dive, and in this sense it would be more correct to call the Ju-88 a "semi-dive" bomber. The undoubted advantages of the Ju-88 include duplication of protected oil and gas systems and control wiring, and automation of aircraft and engine control, unique for its time. Thus, all operations associated with the entry and exit from a dive were

automated (after the pilot released the air brakes, the machine put the

Availability dive, after dropping gas tanks, aircraft into a the bombs, the elevators were also automatically transferred to the exit from the dive, while the automatic limiting current overloads provided the necessary curvature of the trajectory); when climbing, the afterburner mode of operation was automatically turned on and off

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motors, after reaching a certain height, the 2nd speed of the supercharger was automatically turned on, etc. All this

allowed the pilot to focus on the combat mission without being distracted by many routine operations. Like our DB-3f, the Junkers was equipped with a course autopilot capable of replacing a pilot at the cruising flight stage, but the radio communications and radio navigation equipment of the German aircraft was more diverse and perfect.

The dubious advantages of the Junkers include the all-in-one cabin layout that the Germans loved (the same was adopted on the Dornier-17). The entire crew (pilot, navigator, scorer, two gunners) was in one cramped cockpit back to
back.

Cabin "Do-17z"

The idea was in psychological support, as well as the possibility (very conditional) to replace a killed or wounded crew member. In fact, several shells of a 20-mm air gun, not to mention a “full-weight” anti-aircraft shell that exploded in the cockpit, disabled the entire crew.

Just as on the Dornier and Heinkel, the abundance of machine guns protruding from the side does not indicate the great power of defensive fire. In reality, only two rifle-caliber machine guns could fire at the same time (back-up from the cockpit and back-down from the ventral gondola), and with very limited sectors of fire and the duration of fire, limited by the capacity of stores (belt feed and a heavy machine gun appeared on the Junkers only at the end of 1941). Combat

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survivability, of course, was also reduced by the traditional use of liquid-cooled engines for German aircraft of that time. In short, “there were some shortcomings,” and yet the Ju-88 as a whole, in terms of the entire set of performance characteristics, undoubtedly surpassed the Soviet SB and DB-3f, the British Blenheim or Wellington.

In May 1940, the Junkers underwent extensive tests at the Air Force Research Institute. All the technical innovations that German engineers struggled with for many years (and prototypes of the aircraft struggled during testing) went to Stalin in finished form and at a reasonable price. Another thing is surprising - Soviet engineers and the Soviet aircraft industry incredibly quickly copied and introduced into mass production all the most valuable. And the most valuable was the automation that provided dive bombing. Unbelievable, but true - already on July 27 of the same 1940, tests of a Soviet dive bomber with brake grilles and an output machine “like the Ju-88” began. Such rates were explained not only by the frantic race in which the military industry of the “peacefully sleeping” Soviet Union was, but also by the fact that by the time the German Junkers was acquired, a significant scientific and technical reserve had already been accumulated. Beginning in 1939, there were flight tests of diving

variants of the SB bomber.

In the same year, TsAGI developed, installed on the "SB" and successfully passed the entire set of tests, the PB-3 bomb rack, which ensured the withdrawal of bombs from the bomb bay during dive bombing (that is, exactly what the Junkers lacked) . The bomb rack worked flawlessly and ensured the release of bombs at dive angles up to 80 degrees. At the same time, a domestic automaton for limiting overloads at the exit from a dive was developed and successfully tested (although it maintained a relatively low overload at the level of 2.9 units, which, in turn, required speed and dive angle limitations). On February 18, 1940, flight tests of the SPB (high-speed dive bomber) designed by Polikarpov began (and they began successfully ...). A maximum speed of 520 km / h was reached, with

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At the same time, thanks to a moderately high specific wing load (160 kg per sq.m.), the aircraft demonstrated excellent takeoff and landing characteristics. But the Arkhangelsky design bureau came closest to creating a full-fledged front-line dive bomber, which carried out another deep modernization of the SB. The new pointed

nose of the fuselage, aerodynamically "clean" engine nacelles (thin flat cooling radiators were moved under the wing), the new TSS-1 upper machine-gun turret recessed into the fuselage changed the appearance of the aircraft - a veteran of the Spanish and Finnish wars - beyond recognition. The main changes were, as always, hidden inside. The aircraft was equipped with a complete set of equipment for dive bombing (automatic withdrawal, brake grids, PB-3 bomb rack). Tests of the reference sample for serial production began in October 1940 and ended in January 1941 (by this time, in connection with the new aircraft naming system established in the USSR by the name of the chief designer, the dive bomber was called "Ar-2"). In February 1941, the Air Force Research Institute received the next version of the Ar-2, modified according to the results of state tests of the prototype, for flight tests. In terms of all altitude and speed characteristics, the new Soviet bomber surpassed the best German Ju-88 A5 at that time (see Table 6).

Table 6

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	Германия, 1940 г. «Ju-88» A5	СССР, 1941 г. «Ар-2»	СССР, 1941 г. «АНТ-58» (103У)
Двигатель, мощность, л/с.	2*Jumo-111 H1, 1200, Ж/О	2*М-105, 1100, Ж/О	2*АМ-37, 1400, Ж/О
Вес макс, кг	12 500	8 150	11 477
Вес норм., кг	10 400	6 600	10 435
Вес пустого, кг	7 700	5 160	7 823
Удельная нагрузка, кг/кв. м	191,5	137,5	215,1
Удельная мощность, л/с. на тонну	231	333	268
Скорость макс, км/час / на высоте, км	450 / 5,5	512 / 5,0	610 / 7,8
Скорость крейсерская, км/ч	350	390	442 (586?)
Скорость у земли, км/ч	363	443	482
Потолок, м	8 200	10 000	10 500
Дальность, км / при бомб. нагрузке, т	1700 / 0,7	990 / 0,5	1900 / 1,0
Макс. бомбовая нагрузка, т	2,4	1,5	3,0 + 10*РС-132 + 2*20-мм
Оборонит. вооружение	4*7,9-мм	4*7,62-мм	3*7,62-мм
Экипаж, чел.	4	3	4

According to all weight characteristics (empty weight, normal, maximum), the Ar-2 was 1.5 times lighter than the Junkers. Of course, this is not a virtue. In terms of the “range - load” parameter, the Ar-2 was noticeably inferior to the Junkers, moreover, the Ar-2 crew had only one shooter, which undoubtedly reduced the possibilities of active defense. Simply put, the Ar-2, which appeared as a result of a deep modernization of the SB light bomber, still remained a representative of a “weight category” other than the Ju-88. At the same time, in terms of the weight of the bombs dropped in a dive, the Ar-2 was one and a half times more than the heavier Junkers, one and a half times. This paradox is easily explained - unlike the German competitor, the Ar-2 could drop bombs of both external and internal suspension (3 * FAB-500 or 4 * FAB-250) in a dive.

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"Ar-2"

Tests showed that the aircraft dived steadily at a speed of 550 km / h at angles up to 75 degrees. Automation worked successfully and reliably, providing an exit from a dive with an overload of 4.5 units. When bombing from level flight, the Ar-2 could take a maximum of 12 FAB-100 bombs (8 in the bomb bay and 4 on the underwing holders) or 6 heavy FAB-250 bombs (four on the internal and two on the external sling). It is worth paying attention to the record high power-to-weight ratio of the Ar-2, thanks to which it gained a height of 5 km in 7.1 minutes (in this parameter it surpassed not only any German bomber, but also the twin-engine Messerschmitt fighter "Me-110") and took off on takeoff in 11 seconds (i.e., faster than the latest high-speed MiG-3 interceptor)! The fact that the plane was just another modification of the most massive bomber

of the Soviet Air Force of the 30s greatly simplified and accelerated the process of mastering the Ar-2 in combat units. The report on state tests stated that ***"the flight properties of the Ar-2 aircraft are similar to those of the SB aircraft, and the control of the aircraft is even easier."*** "Plan for the retraining of the flight personnel of the Red Army Air Force units on the new materiel for 1941" dated February 19, 1941, provided that the first 11 bomber regiments rearmed on the Ar-2 were to complete their studies by May 1, 1941. Very quickly (due to the interchangeability of most of the components and assemblies with the “SB” worked out in previous years), the serial production of “Ar-2” was also unfolded. The first 71 cars were produced at the end of 1940, even before the completion of state tests. Plan for the production of combat aircraft, established by the Decree of the Council of People's Commissars and the Central Committee of the All-Union Communist Party of Bolsheviks No. 2466-1096ss

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dated December 7, 1940, provided for the release of 1000 Ar-2s in 1941, of which 600 in the first half of the year. But none of this happened. On February 11, 1941, the Ar-2 dive bomber was taken out of production. In total, the huge Moscow aircraft factory No. 22 managed to produce 198 aircraft, of which, as of June 1, 1941, 147 aircraft were in combat units of the Air Force of the western districts. The few “arches” that survived the battle of the first days of the war took part in the battle for Moscow, and the vehicles that entered the Air Force of the Fleets stood in service right up to 1944 ...

By the time the Soviet-German war began, there were very few Ar-2 high-speed dive bombers. There were no ANT-58/59 bombers (aka 103U, aka Tu-2) in combat units. Nevertheless, it is impossible to complete the review of the bomber aircraft of the beginning of World War II without remembering this aircraft. The reason is simple - he was the best of the best. In support of this statement, one can cite the opinions of many experts - from the Commander-in-Chief of the Air Force during the Great Patriotic War, Air Marshal A. Novikov, to the aircraft designer and most authoritative historian of domestic aviation V. Shavrov. But, in our opinion, the most convincing certification of the ANT-58 (Tu-2) is the duration of its combat service. The design of the "product 103" was officially started on March 1, 1940, the first flight was made on January 29, 1941, the aircraft was in serial production until 1952, took part in the Korean War of 1950-1953, was in service with the Soviet Air Force until 1955. In July 1947, the first Soviet Tu-12 jet bomber was built on the basis of the Tu-2 airframe. Such a long life of a combat vehicle is not accidental. In the early 40s, Tupolev's designers created an aircraft that was far ahead of its time.

Returning to the year 1941 and comparing the performance characteristics of the 103U bomber with the best Luftwaffe bomber at that time, we come to the conclusion that we have that very rare case in the history of aviation when a combat aircraft surpasses its competitor

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for all parameters without exception (see Table 6). Of particular note is the most powerful armament of the ANT-58. The entire bomb load (internal and external suspension, including the FAB-1000) could be dropped both from level flight and from a dive. The robust design allowed bombing from the so-called "high-speed dive" at a phenomenal speed of 900 km / h (this made it possible to break through the concrete floors of pillboxes or armored decks of heavy ships). For action as an attack aircraft, the aircraft was armed with 10 132 mm caliber rockets, two 20 mm cannons and 2–4 rapid-fire machine guns in the forward fuselage. The plane flew steadily with one idle engine (during the tests of the "103rd" it flew from Omsk to Moscow on one engine!), It had a high cruising speed (according to some sources - up to 586 km / h), had a fairly powerful, by

the standards of its time defensive weapons (two machine guns could fire back-up and one back-down at the same time), gas tanks were protected and equipped with an inert gas pressurization system, the pilot and gunners' jobs were partially armored. In combination with high flight speed (at high altitude, the ANT-58 was not inferior in speed to the then best German Messerschmitt Bf-109F-2 fighter at that time), all this was supposed to provide exceptional combat survivability. In 1941, a bomber with such parameters did not exist on paper, but in metal. In May - July, flight tests of the ANT-58 were completed and the aircraft was recommended for the earliest possible introduction into mass production. But nothing of the sort happened. Usually, the “weakness” of aircraft factory No. 166 in Omsk, which in the fall of 1941 still had neither a ceiling nor a floor, is cited as the main reason. Sounds convincing, but very strange. Why did the best front-line bomber in the world (and with

it the oldest design bureau in the country) end up among bare walls without a ceiling? What, then, were loaded with those factories that had both the ceiling and the latest imported equipment, skilled workers? The mysterious, at first glance, the fate of the best Soviet bombers Ar-2 and ANT-58 cannot be understood in isolation

And tens of thousands

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from the history of the pogrom that was perpetrated at the turn of the 30s - 40s in the Soviet aircraft industry and the leadership of the Air Force, but we will return to a detailed consideration of this issue later, in Part 2.

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Chapter
7 HOW FIGHTER WORKS FIGHT

Fighter. Hunter. Pursuer. So these aircraft were called in Russian, German, English, but all these terms (to a greater or lesser extent) distort the real role and tasks of this type of aviation. Not "air tournaments" - and even more so not fighter-to-fighter duels - are the combat work for which the Air Force is created. The essence of this work was succinctly and clearly defined by the Field Manual of the Red Army (PU-39) as follows: ***"The main task of aviation is to promote the success of ground forces in battle and operation."*** Fighter aircraft were not (it would be better to say "should not have been" - the Luftwaffe falcons were often fond of "hunting" to the detriment of work) an exception to the general rule. The achievements of fighter aviation are measured not by the number of stars (or aces of clubs) on the fuselage of a successful "hunter", but, above all, by how it ensures the operation of its strike aircraft and protects its troops from air strikes.

Without further ado, here is a lengthy quotation from the monograph by G.V. Zimin Tactics in Combat Examples. (31) The author of the book is a marshal, Hero of the Soviet Union, during the war years he commanded a fighter aviation regiment and knows what he writes about firmly. He formulates the tasks of fighter aviation in the following sequence:

> “- to cover troops on the battlefield and front-line rear facilities from enemy air strikes; - to ensure the combat
> operations of other branches of aviation; - prohibit the enemy from conducting aerial reconnaissance: - conduct aerial
>
> reconnaissance; - to carry out the
> fight against airborne assaults
> enemy;

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- destroy ground targets. ...

During the Great Patriotic War, **covering troops** ***(emphasized by me.*** - M.S.) on the battlefield and in tactical depth was one of the most important combat missions for fighter aircraft. Front-line fighters made **47.4% of all sorties** performed during the war years to carry out its operation ... Our fighters spent 31,330 sorties during the war to fight enemy aircraft using the "free hunt" method, which amounted to 5.7% of all sorties made for cover ***(i.e., only 2.7% of the total number of sorties by fighter aircraft.*** - M.S.)

... Ensuring the combat operations of other branches of aviation was also one of the important tasks for fighter aviation. To accomplish this task, front-line fighters spent **37.1% of all sorties** made during the war ... Although escort forced fighter aircraft to passively wait for a meeting with the enemy, and also led to increased costs and funds, this method, due to its simplicity and reliability was considered the main one until the end of the war ... ... In most cases, our fighters were involved **in operations against ground**

targets along with their other tasks. At the same time, there are many examples from the experience of the war, when such actions were carried out against predetermined targets, or against objects that were detected by fighters in flight, such as railway trains, convoys, etc. The use of bombs by fighters accompanied by attack aircraft and bombers intensified attacks on enemy troops and equipment, and when acting on enemy anti-aircraft artillery firing points, it reduced the effectiveness of its actions and reduced the losses of our aviation ... "

Now we will give the opinion of another authoritative specialist who ended the war with the rank of generalissimo. Comrade Stalin, as befits the Supreme Commander, expressed his opinion in

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the form of orders. Here are excerpts from two orders of 1942. Although this takes us somewhat beyond the time frame of this book, these orders are important in that they reflected the experience of real combat operations accumulated over a
year of the war. Order No. 0489 of June 17, 1942.

> “... our fighters go to the trick of the enemy, get involved in an air duel with enemy fighters and thereby enable enemy bombers to drop bombs on our troops or other objects of attack with impunity. Neither pilots, nor regimental commanders, nor divisional commanders, nor commanders of the Air Forces of the fronts and air armies understand that the main **and main task of our fighters is to destroy enemy bombers in the first place *(emphasis mine.*** - M.S. .), to prevent them from dropping their bomb load on our troops, on our protected facilities ... "

Order No. 0496 of June 18, 1942.

> “The experience of the war has shown that our fighters on the battlefield and in the nearest military rear at a depth of 20–30 km from the front line can successfully carry out the tasks of day bombers along the way. After dropping bombs, fighters carry out their main task of destroying the air enemy and covering their troops. The use of fighters on the battlefield for bombing during the day significantly increases the strike force of our aircraft, our bomb shots. It should be noted that the Germans and the British use single-engine
> fighters as day bombers. Bomb racks (two beams on each aircraft) were installed on our fighters not by chance and not to decorate the aircraft,
> but in order to use these

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> aircraft for a daytime bombing attack on the enemy, on his manpower and equipment on the battlefield ... "

What conclusions can be drawn from the above, at first glance, obvious theses? Firstly, the approach adopted throughout the Soviet historiography of the war, according to which a large part (emphasis on the first syllable) of the Red Army Air Force fighters was declared non-existent only on the grounds that they were inferior in speed to the Messerschmitt by the Nth number of km / h ", is a complete absurdity. Even if they were significantly inferior to the German fighters in the totality of their performance characteristics (whether this was actually the case, we will find out a little later), this circumstance does not mean at all that their ability to perform real fighter aviation tasks is equal to zero. Nothing like this. Escorting bombers, attacking ground targets, close reconnaissance did not at all require a record high speed of a fighter. Moreover, in fact, all these operations were carried out at speeds accessible even to the slowest "seagulls" (biplane fighter "I-153").

The second, not so obvious, conclusion is that in relation to the tasks of fighter aircraft of the Second World War era, no, even the highest "quality" could replace a simple "quantity". This thesis needs an explanation. Let's imagine the best, newest fighter aircraft, in the cockpit of which sits a superac. Performing 2-3 sorties a day (which is actually the limit of the pilot's physical capabilities - if we don't mean "peak" one-day loads, but long-term combat work), he will be able to provide cover for ground troops for at most 3-4 hours. During the rest of the time (and in the summer in Russia the length of daylight reaches 16 hours), even the most outdated enemy bombers will be able to fly in and bomb freely, as at a training ground. At the same time, five pilots of average training on five very average aircraft in terms of performance characteristics will be able to ensure continuous patrols from dawn to dusk and at least significantly reduce the accuracy and effectiveness of enemy bombers. Yes, of course, patrolling in

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air is an incredibly wasteful way to organize the combat work of fighters - but in this era, without the widespread use of radars at the forefront, there were simply no other ways to reliably cover troops. In addition to the time factor, there is another no less

significant factor of space. In the narrow "patch" of the ring, a highly qualified heavyweight boxer will beat any number of amateurs to a pulp. On the area of the football field, he will be able to catch up and "process" only a few. On the scale of a huge city, his (heavyweight) presence becomes almost imperceptible. It is the same with the war in the air - when meeting with the enemy, the squadron of aces will be able to significantly increase the score of personal victories, but at a distance of 200 km from the base airfield, this squadron can already be considered non-existent.

The same rule (about the fundamental impossibility of replacing the number of fighters with quality) also applies to the second most important task of fighter aviation - bomber escort. For example, imagine a situation where five enemy fighters of the most mediocre quality attack a group of bombers, covered by a single super fighter. Suppose further that this superass is capable of destroying any of his opponents with ease. However, air combat - which in popular books is usually called "rapid" or "transient" - requires a very specific time. The best fighters of that time needed 20 seconds of time and 500 meters of space to complete a full turn. During these 20 seconds, a bomber flying at a modest cruising speed of 360 km / h will move 2 km away from the place of air combat (it is impossible to stop in the air and wait until the fighters “sort it out among themselves”). After a couple more turns, the covered bombers simply “melt” in a foggy haze and become easy prey for a couple of surviving enemy fighters.

In addition to time limits, there are also restrictions on the amount of ammunition on board a fighter. With the rarest, unique exceptions, having used up the entire ammunition load, a highly qualified fighter pilot could shoot down one or two enemy aircraft (this arithmetic will be discussed in more detail below).

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Stories about five planes shot down in one sortie can be safely classified as "hunting stories."

A third, even less obvious, conclusion is that "quantity" itself is a very difficult category. To a large extent, it is determined by the tactics of using aviation - you can have a huge number of aircraft on airfields and at the same time constantly outnumber the enemy in the course of each air battle. And vice versa. A textbook example of this rule was the grandiose air battle "Battle of Britain" (August - September 1940). Thanks to the skillful and massive use of early radar detection, the British Air Force, having a very small force of fighter aircraft, won the battle, concentrating their fighters at the right time in the right place - in the path of the next formation of German bombers. A lot also depended on such a “simple thing” as the reasonably bold basing of fighters on front-line airfields. Let us cite, as an illustration, another order of Stalin: Order No. 0171 of March 4,

1942.

> “... Over the past 1-2 months, our fighters, during sorties to cover troops during their flight, very often appeared on the battlefield for only 10-15 minutes. Instead of revealing the real reasons for this ugly situation, the commanders of the fronts and the commanders of the Air Force began to complain that our fighters had a short flight range and therefore could not cover the advancing troops. What are the real reasons why our fighters spend little time over the battlefield?
>
> The first reason is that our fighter units are located at airfields more than 100 km from the front line, for example, on the Volkhov and Northwestern fronts, which artificially reduces the duration of the flight of fighters over the battlefield.

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> The second reason is that many pilots, without any need, carry out their entire flight at speeds close to maximum, which also reduces the flight range and the time the aircraft stays in the air ... front line for 20-30 km, or, in any case, no more than 50 km ... "

Alas, this was far from the first order demanding that fighter aircraft base airfields be moved closer to the front line. So, on August 8, 1941, the commander of the Air Force of the Western Front, Colonel N.F. Naumenko pointed out to his subordinates that
What:

> “Parts of the Air Force of the front operate from the main base airfields, remote at 80-100 km from the front line, which greatly lengthens the time from the moment the task is set to hitting the target; reduces the range of aviation, especially fighters, for which the time spent and combat operations in the target area is often reduced to 15–20 minutes. Such a short period of time cannot provide adequate fighter cover for either troops, or our bombers, or battlefield scouts ... It should be borne in mind that the enemy, interacting with the troops, as a rule, makes flights exclusively from airfields located in the immediate vicinity of the front line ... "

Yes, the enemy did not yet have time to read the books of modern Russian historians, who bitterly complain that the aviation deployed several tens of kilometers from the border was supposedly doomed to inevitable destruction. The Germans brought their airfields as close as possible to the battlefield. So, the largest fighter squadron "JG-51" (it was then commanded by the best ace of Germany W. Melders) began hostilities from the airfields in Siedlce and Staroves (30-40 km from the border). Already on June 24, fighters

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Melders moved to the airfield in Terespol (western outskirts of Brest). On June 30, covering the crossings across the Berezina and the Dnieper, German fighters took off from the Bobruisk airfield (380 km east of Brest). On July 3, JG-51 fighters were based in the area of Bykhov on the Dnieper, i.e., a few hundred meters from the front line ... Of

course, the concept of "fighter aviation tactics" is much more complicated and broader than the task of choosing a place for an airfield. Without trying to embrace the immensity, let's consider one more

question. The Soviet Air Combat Manual (1943) absolutely unequivocally demanded (p. 18) ***"to identify the commander of the enemy group and try to destroy him in the first place."*** The meaning of setting precisely such priorities is quite understandable: the purposefulness and coherence of the actions of the entire group of enemy aircraft depends on the commander; by destroying it, it is possible to achieve a disruption in the fulfillment of the task assigned to it by the entire group. This was especially important in the case when the target was a group of enemy bombers, because, having lost a commander, the group was often unable to independently find the object and conduct an organized bombing strike. Finally, the group commander is most likely the most experienced and skilled pilot, and by destroying him, you can inflict the most tangible

damage on the enemy. On the other hand, the enemy also understands all this very well, and will defend his commander in every possible way. Thus, fulfilling the requirement of the Instruction, the Soviet pilots inevitably got involved in a tense battle, in which it was difficult to get an extra "star on the keel", but it was quite easy to lose the plane, and with it life. It is noteworthy that in the same "Instructions" the tactics of German fighters were described as follows:

> “According to the repeated testimonies of POW pilots, the tactics of air combat on the part of the enemy are very often based on the fight against single aircraft. To this end, the first attacks and the subsequent battle are conducted with the expectation of breaking our battle formation or, according to

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at least split off one aircraft and concentrate the fire of their aircraft against it.

In the well-known literary biography of the best Luftwaffe ace E. Hartman, written by the Americans Constable and Toliver, this “blond knight” without a shadow of embarrassment talks about his air combat style: “Assess whether the enemy has a ***stray or inexperienced pilot. Such a pilot is always seen in the air. Shoot him down. It is much more useful to set fire to just one than to get involved in a 20-minute carousel without achieving anything.*** (89) It would be possible not to attach great importance to retelling the memories of one (albeit the most successful!) enemy fighter, if it were not clear from the huge number of testimonies of the participants in the war that Hartman was not alone in his tactics. German fighters systematically hunted for newcomers who had lagged behind the group, aircraft damaged in battle. It was not uncommon for Luftwaffe fighters to watch from the sidelines how our “silts” mixed German infantry with the ground, and patiently waited for the moment when a single Soviet attack aircraft, knocked out by anti-aircraft fire, would break away from the group and try to get out of the battle ... Yes, such tactics ensured a rapid increase in the number of personal victories of individual fighter pilots (Hartman himself, as you know, reported on 352 aircraft shot down by him), but it also fundamentally contradicted the fulfillment of the general task facing fighter aviation as a whole.

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Chapter 8 AIR COMBAT: THE LIMITS OF THE POSSIBLE

In the previous chapter, we briefly outlined some of the fundamental aspects of fighter aviation tactics. Now we will try to move from a discussion of problems to concrete, numerical assessments of the effectiveness of the actions of World War II fighters. This is going to be a very boring chapter, with an endless stream of dry numbers. Alas, military history cannot be written like an adventurous novel...

Let's start with the best. From the best of the best. Twelve of the most outstanding aces of the Soviet Air Force: Alelyuhin, Vorozheykin, Glinka. Gulaev, Evstigneev, Klubov, Kozhedub, Koldunov, Rechkalov, Skomorokhov, Pokryshkin, Shestakov - twice and thrice Heroes of the Soviet Union, pilots of the "God's grace". The indicators of this magnificent dozen are as follows: 5359 sorties were completed, 1499 air battles were conducted, 669 enemy aircraft were shot down (individually and in a group). Translating this information into a form that is easier to understand, we get the following averaged picture: out of eight sorties, two led to a battle with the enemy, in one of which a victory was won. Let us remind you once again that we are talking about the best of the best, but even they have seven sorties out of eight - for nothing! Moreover, in this chapter, between the concepts of “declared” and “shot down in reality”, an equal sign is conditionally put - in fact, all the declared achievements of any fighters of any countries can (and should) be reduced several times.

Let's return to the official statistics. In the Air Forces of Great Britain and the United States, only 19 pilots were able to shoot down 30 or more enemy aircraft. There were 91 such pilots in the Soviet Air Force (at the same time, however, it never occurred to a single historian to call Spitfires, Tempests and Mustangs hopelessly outdated trash that cannot be compared with Soviet Yaks) . True, the best ace of the Royal Air Force - a native

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M. Pattle of South Africa did not have a chance to fight on such magnificent aircraft, he won his 50 victories in nine months flying on a really outdated Gladiator biplane, then on a Hurricane. The second in terms of performance - the Englishman D. Johnson - completed 515 sorties and shot down 41 German aircraft, that is, spent 13 sorties on one downed aircraft.

The claimed successes of the best German aces look absolutely phenomenal. The top ten pilots of the Luftwaffe shot down 2,553 aircraft. The personal account of two - E. Hartmann and G. Barkhorn - exceeded the mark of 300 aircraft (352 and 301, respectively). 231 German pilots were able to shoot down 60 or more enemy aircraft - in the Soviet Air Force there were only three pilots with such a number of victories (Kozhedub, Pokryshkin, Rechkalov), in Allied aviation - not a single one. If we now select 10 pilots from among the best Luftwaffe fighters, about whom both the number of declared victories and the number of sorties made are known, then we get the following figures: each shot down an average of 250 aircraft during 860 sorties. In other words, there are two victories for seven sorties (our aces, we recall this again, have one victory for eight sorties). One of the components of the

unusually high performance of the German aces is that they had someone to shoot down. Beginning at least in 1942, Luftwaffe fighters fought against a numerically superior enemy. On any of the many fronts. This conclusion is especially true for the Eastern (Soviet-German) Front. During the war years, almost 36 thousand “silts” alone were released, and they were by no means idle at the rear areas. Thus, the German fighters, whose number on the entire vast Eastern Front in the last years of the war did not exceed 450-500 aircraft, did not experience a shortage of targets, and pilots with a "high-speed" six-month training often sat at the controls of these "targets". With the Western Allies, it was exactly the opposite. German bombers did not appear over the British Isles in the second half of the war. When Operation

Overlord began on June 6, 1944, the landing of the Allied troops in Normandy was supported by a gigantic aviation group, which had a 6-fold numerical superiority. As a result, there was a complete

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a paradoxical situation: despite the obvious dominance in the air, the Allied fighters spent an average of 58 sorties per shot down German aircraft (in fact, even more, since many German aircraft taken into account in this calculation were shot down not by fighters, but by anti-aircraft guns and bomber gunners; others burned down under bombs at airfields). (45) Three thousand Anglo-American fighters that filled the sky over Northern France simply could not find objects to attack.

Finally, we must take into account the fact that the most productive aces of the Luftwaffe flew incredibly a lot! On account of Hartmann 1425 sorties, Barkhorn - 1104. 30 German fighter pilots completed 700 or more sorties each during the war years. In the Allied fighter aviation, no one has such a number of sorties, and only five Soviet pilots (Akhmet-Khan Sultan, A. Alelyuhin, A. Pokryshkin, N. Skomorokhov, L. Shestakov) each have 600 or more sorties on their account. Let's sum up the first results. Of course, all of the
above

The numbers are extremely unreliable.

The exact number of victories won by the best aces will never be established. The available figures are undoubtedly overestimated. Propaganda of the successes of the best fighters is an integral part of military propaganda, which by definition cannot be true. Thus, the performance indicators allegedly achieved by the best fighter pilots show us only that “limit of achievable”, which it is obviously impossible to exceed. That is, stories from children's books ("flew - shot down - sat down, flew again - shot down a couple more") have nothing to do with the realities of war in the air. Even the best planes have 4-8 shots per shot down, and in fact - an even greater number of sorties. In other words, the vast majority of sorties did not bring success in the form of downed aircraft - and this, mind you, among the pilots, who, no doubt, sought to meet the enemy, strived for battle and had a great ability to win in battle. Another extremely important conclusion is that the performance of the best pilots is very weakly related to the comparative characteristics of
the aircraft on which they fought.

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and their opponents. One can argue until hoarseness about who was still better: Messerschmitt or Spitfire, but there is no doubt that if there was some difference in performance characteristics, then it certainly was not 5-10- multiple! Accordingly, it was not at all this difference in horsepower and grams of the “second salvo” that caused the best aces of the Luftwaffe to shoot down the British in hundreds, and the best aces of the Royal Air Force shot down the Germans “only”

dozens.

No less indicative is the example of "internal" (i.e., within the same Air Force) competition of fighter planes. The English Hurricane was undoubtedly inferior in performance characteristics to the legendary Spitfire. Did the difference in the performance characteristics of aircraft affect the results of air battles? Of the 19 RAF aces who shot down 10 or more enemy aircraft during the Battle of Britain, nine flew Spitfires, nine Hurricanes, and one (Bob Doe) flew each of these types. Of the 15 squadrons that achieved 30 or more victories during the “battle”, 8 were armed with Spitfires, and 7 with Hurricanes. In terms of the total number of victories, in the first place is ... the Hurricane (638 German aircraft were shot down by the Hurricanes and only 511 by the Spitfires). (45)

Now, from discussing the successes of the best of the best, let's move on to the results of the combat work of ordinary workers in the air war. What were their achievements? Are their personal scores comparable even to a small extent with the long lists of victories of the best aces?

> “The experience of the war makes it possible to draw such a conclusion. In each regiment there were about 5, maximum - 7 pilots, who shot down much more in air battles than others (they accounted for about half of all downed enemy aircraft).
>
> ***(31)***

The authorized strength of a fighter regiment in the Soviet Air Force changed three times. At the very beginning of the war - 64 pilots, then, in August 1941, after the huge losses of the first weeks, "for

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ease of management "the staffing of the fighter regiment was reduced to 20, then in the fall of 1942 they switched to a structure of three squadrons and 32 aircraft and pilots. Finally, in the summer of 1943, the regiment had 40 aircraft, and this number remained until the very end of the war. Thus, 5–7 pilots shot down on average as many enemy aircraft as the remaining 25–35 people!

As an illustration of the above, it is worth citing the statistics of the combat work of one, but very famous fighter aviation regiment. We are talking about the Normandie-Niemen regiment, which fought as part of the Soviet Air Force, staffed by French volunteer pilots (the regiment, by the way, was officially considered part of the Free French Armed Forces, the pilots were allowed to wear French military uniforms and French orders, documentation was kept in French). In just two years of the war (from the spring of 1943 to May 1945), 98 pilots took part in the hostilities. More than half of them did not shoot down a single enemy aircraft, but 17 pilots accounted for 200 victories (73% of the total number of 273 downed German aircraft). The four best fighters (Marcel Albert, Roland de la Poip, Jacques André, Marcel Lefevre), awarded the title of Hero of the Soviet Union, completed a total of 559 sorties and shot down 62 aircraft, which accounted for almost a quarter of all the regiment's victories. (91) Almost the same (i.e., huge) gap in performance between the best and everyone else was in the Allied fighter

aircraft. During the war years, 5,000 fighter pilots passed through the American 8th Air Force deployed in the British Isles. Of these: - 2900 (58% of the total) people did not shoot down a single German aircraft; - 261 pilots (5.2%) won 5 or more victories in the sky; - and only 57 people (1.1 ***%)*** announced the

destruction of 10 or more enemy aircraft. (45, p. 217)

In short and simply put, only one pilot out of a hundred fell into the category of

aces! The example of the 8th Air Army is not sufficiently indicative, since the fighters carried out mainly

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tasks of escorting heavy bombers, and in the course of this work, victory scores grow extremely slowly. British fighters in 1939-1940 fought a more varied war in the air, but their proportions were the same ***"In each squadron, only two pilots managed to take the lead and account for half of all the aircraft shot down by the squadron." (45,*** p. 44) The Royal Air Force Fighter Squadron is at least (there should have been more) 12 pilots. 2 out of 12 is quite consistent with 5–7 out of 40 in a Soviet fighter regiment.

And here we again approach the question of the relationship (more precisely, the almost complete absence of such) between the performance characteristics of a fighter aircraft and the personal performance of a fighter pilot. And the best aces, and those 58% of the pilots who did not shoot down a single German aircraft, flew the same fighters. It is in civilian life that big bosses drive Mercedes, which even outwardly bear little resemblance to those “buckets of nuts” in which ordinary people drive. Nothing like this happens in aviation. Not a single additional nut can be screwed onto a production aircraft "with impunity" without changing the centering, aerodynamics, strength, rigidity and other obscure, but extremely important categories. Therefore, no one made any special “aircraft for aces”, with special engines or unusual weapons. They flew on the most ordinary serial machines, and for them they turned out to be good enough to shoot down enemy aircraft in tens and hundreds.

"The best fighter is the plane with the best pilot in the cockpit." This is the rule for all time. It remains valid even in our era, the era of radars, thermal imagers, ballistic computers, homing missiles and other miracles of electronics. This statement is all the more true for the 40s of the XX century.

A key element in the effectiveness of the air was experience, the real combat experience of the pilot. And if at present this experience can be at least to a small extent replaced by many hours of on a computer simulator simulating overloads, aerial shooting, the behavior of a mock enemy, and so on, then in the era of World War II there was nothing of the kind. Shooting at the towed "cone" only very remotely resembled a real one.

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air battle. Under these conditions, the presence or absence of real combat experience decided almost everything. But in order to gain such experience, one had to somehow survive the first sorties. Most of the young pilots did not succeed, and they continuously replenished the list of those “58 percent” who never managed to achieve a single victory in battle ***(“the squadron lost 80 pilots in a fairly short period of time, of which 60 never shot down a single Russian aircraft).*** (43) How and why did that statistically insignificant minority of pilots (one in a hundred) appear who became aces? Hardly anyone knows the answer to this question. Some - such as, for example, A.I. Pokryshkin - in the

very first sorties they demonstrated piloting skills, flight intuition, and accurate shooting. Others, on the contrary, started extremely weakly. So, the second number according to the “world rating” (301 victories) G. Barkhorn did not win a single victory in the first 119 sorties, but he himself was shot down twice! For the best Soviet ace I.N. Kozhedub’s first flight almost became the last (the Germans shot him down, and then fired on by Soviet anti-aircraft gunners), then for three months of fighting he could not shoot down a single enemy aircraft ... Be that as it may, but if the individual characteristics of a person, or a happy fate , or something else allowed the pilot to survive and gain experience in air battles, then the process went on, as they say in technology, with “positive feedback”. With each new sortie, flying, tactical and shooting skills grew, the score of victories grew, self-confidence grew; all this together made it possible to survive in the next sortie, which added another grain of combat experience ... At the “output” of the process, the aces of the Luftwaffe appeared, on whose account there were 700-800-1000 sorties and hundreds of downed enemy aircraft.

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Chapter
9 SEARCH AND DESTROY

The practice of war demonstrates quite clearly the obvious truth: if there is desire, skill and competent command, fighter aircraft can successfully carry out their tasks on any aircraft. With only two clarifications - there should be quite a lot of these "any" (at least as many as the enemy) and their performance characteristics should be approximately comparable to the performance characteristics of enemy aircraft. On the other hand, in the absence of at least one of the above conditions (desire, skills, command), no miracles of technology will save you from defeat. We will find many examples of this in history. It is enough, for example, to compare the level of technical equipment of the Soviet army and the Afghan Mujahideen. Or the American army and the communist guerrillas of South Vietnam ... Alas, such a simple answer disappoints the reader. The reader expects (and

even demands) a serious approach to the problem. It is necessary to argue about how the increase in the rate of climb near the ground from 17.4 to 19.0 m / s affected the course and outcome of the war in the air during the transition from the E-series Bf 109 to the new F modification. Many readers know for sure that this the increase in the vertical speed of the "Messer" by 1.6 m / s finally turned our "I-16" into hopelessly outdated, worthless trash. Let's not disappoint the reader (after all, he paid his own money for this book). Finally, we will discuss the performance characteristics of fighter aircraft. And let's take it seriously. No quotes.

1. DETECTION

So how does aerial combat begin? Quite right, with enemy detection.

And to do it in the air is not at all as easy as in a computer “flying shooter”. The sky is big, but the plane is small. On a bright sunny day, in absolutely transparent air at a distance of just

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only 5 km fighter "I-16" looks like a fly on the glass, if you look at it from the far corner of the room. Well, in fog, haze or from a greater distance - it is not visible at all. That is why, before the advent of airborne and ground-based radars, meeting enemy aircraft in the sky was rather a rare exception, and not at all the rule. That is why even our best aces had only two air battles for eight sorties. Only rational tactics of combat use, i.e., in the end, what is now called

the "human factor" could affect the likelihood of a fighter meeting with the enemy. Enemy detection was based on a developed system of ground air surveillance, warning and communication posts (VNOS), required constant and stable radio communications with ground command posts, and close interaction with ground forces. In the presence of such interaction, the enemy sometimes does not have to be looked for - he himself flew to the area of tank breakthroughs, pontoon crossings, and railway junctions.

If we talk about the performance characteristics of the aircraft, then a comparative analysis of all the fighters of the beginning of World War II leads us to an extremely simple conclusion - everyone is equally bad. Of course, there were no airborne radars anywhere - neither on the outdated I-16 donkey, nor on the newest F-series Messer. the disadvantage of the layout scheme with the location of the engine in the forward fuselage (the fact is that the wing must be located in a strictly defined way relative to the center of gravity of the aircraft, and the engine, as the heaviest unit, shifted the center of gravity forward, following the center of gravity forward "left" and wing). The only type of aircraft in which the downward view was significantly better than that of its competitors was the American Airacobra fighter. This aircraft had a unique layout scheme with the engine placed behind the cockpit (the rotation of the propeller was transmitted by a long shaft passing under the pilot's seat).

The view ahead was a little better. In front of the windshield of the cockpit there was either a long and narrow liquid-cooled motor, or a much shorter, but more

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wide, air-cooled motor. The cockpit was recessed into the fuselage, and the upper edge of the canopy smoothly passed into the fairing (the upper rounded surface of the rear fuselage). This layout was rational in its own way, as it provided the lowest possible aerodynamic drag, as well as greater flexural strength of the fuselage. The struggle to save the weight of the fuselage led to the fact that the view back was zero, and the fact that he was attacked from the rear hemisphere, the pilot found out - if he knew - only when he saw machine-gun tracks rushing along the cockpit canopy ... The view back was a little better only on "Spitfire":

the cockpit canopy had a small spherical elevation above the pilot's head, and outside the canopy, in the air flow, a small rear-view mirror was installed in a fairing. It was possible to significantly improve the rearward view only by “cutting off” the fairing (which, in turn, required strengthening, and therefore weighting, of the fuselage structure). This is exactly what British, American, Soviet designers did. The latest modifications of the "yaks", "Spitfires", "Mustangs" were distinguished by low fairings and a completely open view to the rear. Adopted in 1941 - 1943, the new fighters (German Focke-Wulf-190, English Tempest, American Thunderbolt) were already initially designed with "raised" cockpit lights. And although a person’s head still does not turn 360 degrees, but with the installation of a rear-view mirror, the new layout has significantly improved the situation with protection against sudden attacks from the rear hemisphere.

The only exception (for the worse) to the general rule was the Messerschmitt Bf-109. For 10 years of the life of this aircraft (from 1935 to 1945), no changes were made to the layout of the cockpit and the rear of the fuselage, and poor rearward visibility remained one of the main shortcomings of the Messer. ***“Not without reason, this aircraft is considered the most “blind” of all types of fighters”*** - this was said about the “Bf-109” in the Soviet “Manual on Air Combat”. Most likely, it is the exceptionally poor visibility on

single-engine fighters of World War II that can serve as an explanation for the paradox that pilots who won incredibly

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a large number of victories, they themselves repeatedly replenished the list of victories of enemy fighters. The best aces of all times and peoples Hartmann and Barkhorn were shot down 4 times and 9 times, respectively. E. Rudorffer and G. Baer, the seventh and eighth numbers in the list of the most productive aces in Germany, who won 222 and 220 victories, respectively, were shot down 18 (eighteen) times each! Statistics, as you know, is the science of large numbers. Let's move on from four special cases to a general picture. Of the 100 best aces of the Luftwaffe, who shot down from 352 to 102 enemy aircraft each, only 55 people survived until the end of the war. The biography of 45 pilots ends with the words "killed" or "missing." Who could defeat these super-aces? Without opening a single reference book, we can say that they were shot down by pilots with a very modest number of "stars" on the fuselage - simply because there were no others. There were no pilots in either the Soviet or the Allied Air Forces who would have had 220 or “at least” 120 victories in their assets. Baer, Rudorffer and all the others dozens and hundreds of times were shot down by pilots of average, and even elementary

qualifications. This is strange. Agree that among all the beginner boxers on the planet it is impossible to find at least one who could enter the ring and knock out M. Tyson. The same question can be formulated in a different way: is there such a technique with which even the weakest and most inexperienced boxer can knock out Tyson? There is such an approach. Watch in a dark corner and hit the head with a long shaft. Yes, in civilian life, such behavior will be called a criminal offense, but in war this is how the simplest and most effective way of conducting air combat was built. ***“My tactic was surprise. Climb higher and, if possible, go from the***

side of the sun ... Ninety percent of my attacks were sudden, in order to take the enemy by surprise ... The pilot who sees the other first has already won half the victory. This is how E. Hartmann described his tactics. No miracles of aerial acrobatics. Seen first, attacked first.

“Be the first to spot the enemy, close quickly and attack suddenly, firing long bursts from small angles.” These are the recommendations of V. Melders, which he outlined in the instructions

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for pilots of the Luftwaffe, compiled on the basis of the results of battles in the skies of Spain. Melders himself, as you know, by the summer of 1941 became the best ace in Germany (115 downed aircraft), was awarded all the existing awards of the Reich and was appointed to the post of "inspector general" of aviation.

“As a rule, I did not compete with enemy pilots in maneuverability. I could make one turn just to look around, and even then I did it infrequently ... Most of all I liked to attack from above, as quickly as possible, and then, having fired at the enemy, immediately went to the side and up ... "American D. Meyer commanded a Mustang squadron, personally shot down 23 German aircraft, then fought in Korea and ended his military career with the rank of lieutenant general.

> “From reports on fighter battles, it is clear that almost 80% of the victims, as a rule, **do not see the attacking enemy *(emphasis added by me.*** - M.S.) or realize that they are being attacked only at the moment when the enemy already has all the advantages ... Long maneuverable battles in the air were rather the exception to the rule ... spending more than 20 seconds on one enemy meant allowing another to go behind the attacker ... "

Mike Speke, Aces of the Luftwaffe.

To realize the advantages of such tactics and at the same time not to become a target for a surprise attack from behind was possible only through well-thought-out tactics: rational formation of battle formations and well-developed interaction in a group. Special tactics were also developed that made it possible to outstrip the enemy in detection in a group flight. One of them was called differently in different countries: “scissors”, “weaver”, but the meaning was the same. Aircraft (all or only part of the group) do not fly in a straight line, but along a wavy curve, on opposite-intersecting courses, while observing the situation "on the tail" of each other. Of course, this is only a small part of the totality of tactics,

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ensuring timely detection of the enemy. Extra kilometers of speed did not affect all this in any way.

2. WEAPONS

Air combat begins with the detection of enemy aircraft. It ends with accurate and effective shooting. This is the end point of the whole process. Everything else is just preparatory work. The whole process of intercepting an air target - search, detection, rendezvous, complex aerobatic maneuvers, exit to

optimal position for firing - devoid of any

practical sense if, in the end, port weapons are not capable of destroying an enemy aircraft. Moreover, if at the stage of search, detection and maneuvering, the shortcomings of equipment can still be compensated to some extent by tactics, then there is nothing to replace the powerful fire of airborne weapons.

The search for the optimal armament scheme for a fighter aircraft went on until the end of the war, while the crop between supporters of cannon or machine gun weapons was never allowed. We will try to briefly describe the problem and the approaches to its solution that had developed by the beginning of the 1940s.

The plane is moving very fast. This is what distinguishes it from all other targets at which people used to shoot with bows, muskets, rifles and machine guns. A typical early World War II bomber had a fuselage length of about 15 meters and a cruising speed of 100 m/s. This means that it traveled a distance equal to its own length in 0.15 seconds. And this is a slow-moving bomber at cruising speed. The fighter (fuselage length 8 meters, speed - 150 m / s) flew a distance equal to its own length in 0.05 (five hundredths) of a second. Now let's compare these figures with the parameters of the rate of fire of conventional small arms. The Kalashnikov assault rifle can theoretically fire at a rate of 10 rounds per second. Or one shot in one tenth of a second. With such a rate of fire (and when firing from a direction strictly perpendicular to the line of motion of the aircraft), at most one bullet will hit a fighter, and a bomber

— two.

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But two rifle-caliber bullets for a bomber are like a "shotgun pellet for an elephant." Of course, with a particularly successful (or unsuccessful - this is from which side to look) set of circumstances, even one bullet that hit the pilot can lead to the loss of the aircraft and crew. On the other hand, the practice of the world war showed that the German Dornier and Heinkels returned safely to their bases during the days of the Battle of Britain, having up to 200 bullet holes. In the above shooting

conditions, however, the most important thing is not taken into account: the bullet reaches the target quickly, but not instantly. As will be shown below, the initial velocities of projectiles and bullets of aircraft guns and machine guns fall within the range from 550 to 900 m/s. This is the speed at which the projectile leaves the barrel. It will not be possible to fly by inertia at a speed 2–2.5 times the speed of sound for a long time due to air resistance. Without going into the intricacies of aerodynamics, let's conditionally take the time of flight of a bullet at a distance of 500 meters equal to one second. In this single second, the fighter plane will move 150 meters. This means that an error in the lead calculation of only 5% will lead to a guaranteed miss. There was no ballistic computer associated with a laser

(radar) rangefinder. The range, speed of the target, the direction of its flight were determined "by eye", due to the experience or incomprehensible intuition of the pilot. All this together means that practically the only position for aimed shooting was flying strictly along the axis of movement of the enemy aircraft, either directly in the forehead, or just as directly, but in the tail. A frontal attack left very little time for aiming and firing. The reason is again the exceptionally high

speed of aircraft. Two fighters flying at a speed of 600 km / h towards each other will reduce the distance between them from 1000 meters to zero in three seconds. But - it is almost impossible to get into the plane from 1000 meters, and it is also almost impossible to turn aside 200 meters before the collision (the typical turning radius of a fighter was 300 meters, and even at half the speed!). In other words, the time of a frontal attack did not exceed 1–2 seconds, after which it turned into a ram. Attack from behind (or better yet -

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behind and slightly below), given the poor rear visibility in a single-seat fighter, could provide much more time - but only for aiming. Seeing the very first traces of enemy shells, the pilot of the aircraft under fire - sometimes even purely instinctively - began an "evasive maneuver", i.e., abruptly changed the direction of flight. This is theory. Now let's look at practice. In general, over the entire period of the war, 90-92% of the destroyed enemy aircraft

were shot down by Soviet fighters during attacks from behind, and 50% of the enemy fighters were destroyed by firing from a distance of less than 100 meters, 39% - from a distance of 100/200 meters. And only 1% was shot down when firing from a distance of 100-400 meters. These figures very clearly indicate that it is incredibly difficult to get into the plane, and it was possible to solve this problem only when firing from an extremely short distance, practically “point-blank range”. Practice has shown that a medium-skilled pilot was able to keep a maneuvering enemy aircraft in the crosshairs of the sight for no more than 2 seconds. It was during this short time that the onboard armament of the fighter was supposed to inflict “damage to the enemy aircraft,

incompatible with life.

Thus, the first requirement for a fighter's small arms is a high rate of fire, which was achieved by a large number of simultaneously firing barrels. The “technically backward” Soviet Union advanced the furthest in solving the problem of the rate of fire of aircraft machine guns. Back in 1932, the Tula gunsmiths Shpitalny and Komaritsky developed the ShKAS machine gun, which showed the highest rate of fire in the world - 30 rounds per second. In 1934, the ShKAS was launched into large-scale production; all Soviet fighters and bombers of the late 30s were armed with it. Not stopping there, Shpitalny and Komaritsky developed in 1937 the UltraShKAS machine gun with a rate of fire of 40 rounds per second. But they were too late, since field tests of the Savin and Norov machine gun with a rate of fire of 45–50 rounds per second began already in 1936. These terrible mechanisms could really "mow" the enemy infantry, like a scythe of grass. However, for the armament of fighters, these (like any

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others) rifle-caliber machine guns were obsolete before they were even born. The

reason for this should be clear to the reader who has carefully read the chapters on the development of bomber aircraft. By the beginning of the 1940s, such measures to increase combat survivability as the protection of gas tanks, the reservation of crew jobs, had become the generally accepted norm. An

armor plate 6–8 mm thick reliably stopped a rifle-caliber bullet, the gas tank protector withstood (i.e., quickly tightened) 20–30 holes. All this does not at all mean that rifle-caliber machine guns at once turned into useless "rattles". One and a half thousand German aircraft were shot down during the "Battle of Britain" by British fighters armed exclusively and exclusively with 7.7 mm machine guns. Nevertheless, further advancement along the path of strengthening the armament of fighters required not the replacement of ShKAS with UltraShKAS (this replacement never happened on production vehicles), but the creation of weapons with a greater lethality. A very attentive reader may remember that in the chapter

on front-line bombers, the Italian Savoia Marchetti was mentioned, whose defensive armament was 13-mm Breda machine guns (Breda). Indeed, the Italian designers were the first to make a clear choice in favor of heavy machine guns. Already during the civil war in Spain, the Italian Fiat CF-32 fighters (which were inferior to the donkey in all flight parameters) turned out to be a dangerous enemy precisely because of their powerful weapons (in particular, the I-16 armored back "did not hold" a large-caliber bullet "Bred"). Soviet gunsmiths, although not the first in chronology, soon became the first in quality. In April 1939, a 12.7-mm machine gun designed by M.E. was put into mass production.

Berezina ("BS", "UBS"). In such important parameters as rate of fire, muzzle velocity (i.e., range and accuracy of aimed fire), bullet energy (and, consequently, armor penetration), the UBS machine gun surpassed its main competitors (the American Colt Browning M-3 and German MG 131). In terms of muzzle energy, the UBS was almost twice as superior

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German machine gun (17.75 kJ versus 9.84). At a distance of 200 meters, "UBS" pierced 15-mm armor. In the Soviet “Instruction” on conducting air combat, we read: ***“Against armor-piercing bullets of large (12.7-mm) caliber, the armor of the Me-109 fighter is practically ineffective, and it can be ignored.”*** Protected tanks of the German fighter withstood no more than 5-6 hits of large-caliber bullets "UBS".

The heavy machine gun, in principle, solved the problem of overcoming the passive protection of aircraft - no one put armor of "tank" thickness (20 mm or more) on aircraft. Practical confirmation of the effectiveness of large-caliber machine guns sufficient to destroy aircraft can be the most massive American fighters: the Mustang and Thunderbolt. They won back until the end of the war, being armed only with 13-mm Colt-Browning machine guns (albeit in large numbers: 6-8 pieces). Moreover, the well-known American Saber jet fighter, which quite successfully fought in the skies of Korea against Soviet cannon MiGs, also had purely machine-gun armament. Nevertheless, many experts reasonably believed that machine-gun armament was capable of

destroying an enemy aircraft only with numerous hits, which, in turn, requires either a relatively long (long-term by aviation standards!) Accurate aimed fire, or the installation of a large number of machine-gun barrels. A lot of barrels means both a lot of weight and big problems with placing 6-8 machine guns in a single-seat single-engine fighter. It is no coincidence that 8 machine guns on the British Spitfire and Hurricane or 6 machine guns on the American Mustang and Thunderbolt were installed in the wings - it was almost impossible to place such a battery in the forward fuselage, already occupied by a bulky engine.

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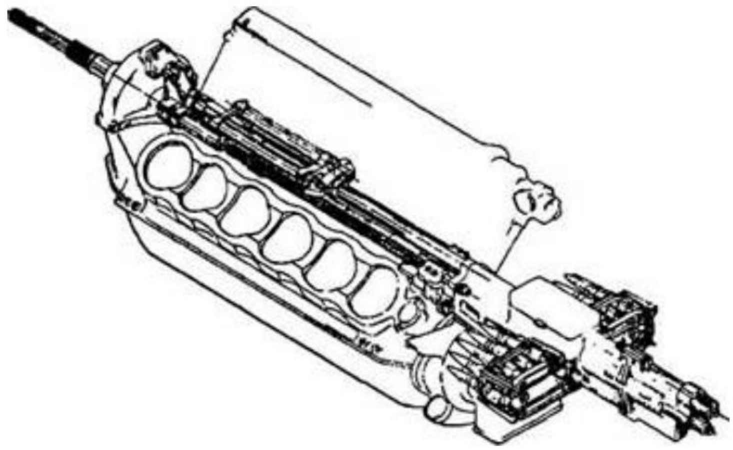

Cannon in the collapse of the engine cylinder

block In turn, the placement of weapons in the wings leads to a long train of problems: wing vibrations reduce firing accuracy, recoil of weapons destroys the wing, the mass of machine guns and ammunition spaced from the axis of symmetry increases the moment of inertia of the aircraft and thereby reduces the angular rate of roll , the installation of machine-gun barrels with convergence to one point, taken out, as a rule, by 200 meters in flight, makes it difficult to conduct accurate shooting from extremely small or, conversely, from long distances. Thus, the intention arose to equip the fighter with a small (in the limit - a single) "barrel", but with such power as would be enough to destroy an enemy aircraft with several accurate hits. Simply put, arm the fighter with a cannon.

Guns are different. Really different. Here are a few typical for the early 40s of the XX century. examples. The 20-

mm cannon of the Swiss company Oerlikon (Oerlicon) MG-FF was very light (weight 28 kg) and compact (length 1.37 m). Alas, its energy characteristics were just as small: Oerlikon had a very low rate of fire (9 rounds per second) for an aircraft weapon and a low initial projectile speed (575 m / s). In terms of muzzle energy, the MG-FF cannon projectile was only slightly superior to the UBS machine gun bullet (19.1 kJ vs. however, only a very highly qualified pilot could realize this advantage in firing range. Another disadvantage (or

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feature) MG-FF can be called shop (in contrast to the tape at the "UBS" and many other guns) food, which limited the duration of firing to 7 seconds, and the bulky round magazine made it difficult to place the gun on the plane. In the end, the designers of the Messerschmitt company had to place two MG-FFs in the wings of the Bf-109E fighter at a distance of about 4.5 meters from each other, covering the stores protruding beyond the wing envelope with special fairings.

The 20-mm Hispano-Suiza HS-404 gun had completely different parameters. This product had nothing to do with Spain, the gun was developed by a Swiss company, produced under license in England and the USA, throughout the war it was the main aircraft gun of our Western allies, and it remained in service with jet fighters until the end of the 50s! Compared to the MG-FF, the Hispano gun was almost twice as heavy (49.5 kg versus 28) and longer (2.5 meters versus 1.37). But she accelerated her projectile to a record speed of 877 m / s and almost three times (!) Exceeded Oerlikon in muzzle energy. The design of the HS-404 made it possible to use this gun with both magazine and belt (i.e., limited only by the size of the ammunition compartment) feed.

As you can see, the same term (“20 mm caliber aircraft gun”) can hide very different meanings. The German 20-mm Mauser MG-151 cannon with a high (13 rounds per second) rate of fire and a high muzzle velocity appeared on serial Bf-109F-4 fighters only in the early summer of 1941. The Soviet 20-mm gun "ShVAK", generally equal in terms of performance characteristics to the German MG-151, entered service much earlier. Serial production of ShVAK began in 1936; starting from 1937, it was installed on serial I-16 fighters of four modifications (type 12, type 17, type 27, type 28). Contrary to the replicated at the suggestion of A.S. Yakovlev in hundreds of books of fables about the fact that in the sky of Spain our machine-gun "donkeys" were mercilessly beaten by cannon "Messers", in reality everything was exactly the opposite - neither the "Messerschmitt" "Bf-109E" with its low-powered MG-FF, nor that more "Bf-109" F with a "Mauser" did not participate in the hostilities of the Spanish tragedy, but the "Messers" of the first series (B, C, D),

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armed only with rifle-caliber machine guns, there was a real chance to meet the sky of Spain with a cannon "I-16" type 12.

Not all that glitters is gold, and the word "projectile" does not yet guarantee the pyrotechnic effect that the modern moviegoer is accustomed to. A 20mm airgun projectile is about two thumbs pressed together. This volume should contain a strong (capable of withstanding colossal overloads when fired) case and a mechanical fuse - a device that solves three tasks at once: remote cocking after the projectile exits the gun barrel, self-destruction in the event of a miss, instantaneous detonation of the projectile when it hits the target (otherwise case, the projectile, having pierced through the wing of an enemy aircraft, will explode in "empty air"). What then remains for explosives? The MG-FF fragmentation projectile contained only 9 g of TNT, while the incendiary projectile contained 4 g of TNT and 3 g of white phosphorus. The German 20-mm high-explosive projectile was considered a unique technical achievement, in the thin-walled stamped body of which German engineers were able to fit 25 g of explosives.

With all this, the damaging effect of a 20-mm projectile undoubtedly surpassed the effect of a 13-mm bullet. On average, 20 hits from 20mm shells were enough to destroy the American "flying fortress" B-17. A 37-mm projectile with a direct hit literally “broke apart” a light single-engine fighter in the air, and even 3-4 shells of this caliber were enough to destroy a heavy bomber. It would seem that the advantage of a fighter's cannon armament over machine gun armament is obvious and indisputable. Alas, appearances are deceiving. It's time to remember the limitations imposed by the "existence equation". Leaving aside the problems of installing a heavy recoil cannon on the fragile design of a single-engine

piston fighter, let's calculate the required weight of weapons and ammunition. The powerful 37-mm Soviet air gun "NS-37" weighed 171 kg. 32 shells (this was exactly the ammunition of the Yak-9T fighter armed with this gun) weighed 50 kg. Total - 221 kg, "employed" in the weight balance of the aircraft by weapons. Eight 7.7-mm Browning machine guns weighed (excluding attachment points) only 80 kg. At the same time

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the same total weight of weapons as on the Yak-9T, 5885 rounds can be attached to these eight machine guns, i.e., 735 rounds per trunk.

735 rounds per Browning is 37 seconds of continuous firing. Please put the book aside and count aloud to 74, evaluate this time interval. Such a duration of firing, acceptable in terms of ammunition load, provided even a pilot of the most basic qualification with a chance to hit the enemy. Even 10% of hits (the figure in this case is rather underestimated) means 589 holes in the enemy aircraft. In other words, a sieve. 10% of hits from the NS-37 cannon, i.e. three 37-mm projectiles, will also be enough to destroy any enemy aircraft.

It's just that it becomes extremely difficult to provide these 10% of hits (if you believe the statistics, it's completely impossible). Why? Firstly, the huge recoil of a full-fledged, no longer “aviation” gun in terms of dimensions, weight and muzzle energy, rocked the fighter so that aimed

firing in bursts became completely impossible: only the first two or three shells went towards the target. In fact, the shooting was carried out with “quasi-single” shots, as a result of which the only shooting available to pilots of average qualification with aiming adjustment “along the Second, the track” became impossible. the rate of fire of large-caliber guns was very low (about 2 rounds per second for the American 37-mm M-4 gun, 4 rounds per second for the Soviet NS-37), which further reduced the likelihood of hitting a maneuvering target.

Military tests of the Yak-9T fighter, carried out in the summer of 1943, showed that for one downed (more precisely, “declared downed”) German aircraft, an average of 31 37-mm caliber shells were consumed, which almost exactly corresponded to the number of shells on board. The act on the results of military tests noted that ***"a pilot flying a Yak-9T must be a kind of sniper and be able to hit the enemy for sure - from the first shot ...".*** For the sake of truth, it should be noted that when firing from the 20-mm ShVAK cannon, standard for armament "yaks", one

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147 shells were spent on a downed plane, which was even a little more than the ammunition load (140 pieces on the Yak-9). (17, p. 28)

Everything is very difficult. Both approaches to arming a fighter (one powerful gun or many light machine guns with a large ammunition load) have their advantages and equally obvious disadvantages. Taking into account the fact that in real conditions of aerial firing no more than 2–3% of the shells hit the target, the Messerschmitt "Bf-109" series F and G-2 (ammunition 150 shells of 20 mm caliber) or our "Yak-9" could shoot the entire ammunition load without achieving the destruction of an enemy bomber. It was necessary to take the next step towards strengthening the firepower of the fighter - to significantly increase the number of 20-mm guns on board (the British Spitfire and Tempest, the German Focke-Wulf FW-190 of the latest modifications were armed with four guns). It would seem that now the problem of weapons has been solved. However, the weight of the armament increased unacceptably, which, in accordance with the "existence equation", led to an increase) in the total weight, which no efforts of aircraft engine designers could compensate for. The fighter inexorably turned into a clumsy "flying barge" with guns ...

Ultimately, the question remained open. The ideal armament scheme was never found. If you look at what the leading aviation powers ended the world war with, then you can conditionally single out both the “American” system (a large number of heavy machine guns), and the “English” (four 20-mm cannons in the wings), and the “Soviet-German” (one large-caliber gun with a central placement in the fuselage). The only thing that did not stand the test of war was the arming of a fighter with any number of rifle-caliber machine guns. As the means and systems of passive defense of bombers were strengthened, machine guns of 7.7 mm caliber completely and forever left the armament of combat aircraft.

We conclude the chapter with two reference tables. It is not possible to unequivocally reduce the entire set of performance characteristics of aviation small arms to any one quantitative parameter. The term "mass" is commonly used.

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second volley", which is the product of the weight of the projectile (bullet) multiplied by the rate of fire. In other words, a "second volley" is the amount of lead that a fighter has time to "drive" into an enemy aircraft in a short period of time while the target is in the crosshairs of the sight. However, this criterion does not at all reflect the striking ability of the projectile.

It is possible to estimate the effectiveness of a weapon by its mechanical power (the product of the initial kinetic energy of one projectile by the number of shots per second).

Table 7

	Калибр, мм	Вес, кг	Темп стрельбы, в/сек	Энергия снаряда, кДж	Мощность оружия, кВт	Секундный залп, кг
«браунинг»	7,7	10	18,3	3,53	65	0,19
MG-17	7,92	11	18,3	3,94	72	0,23
«ШКАС»	7,62	11	30	3,27	98	0,2
MG-131	13	18	14,2	9,84	140	0,5
«браунинг»	12,7	25	12,5	13,76	172	0,54
«УБС»	12,7	22	13,3	17,75	237	0,64
MG-FF	20	28	9,2	19,01	174	1,00
«ШВАК»	20	42	13,3	30,72	410	1,28
MG-151	20	42	13,4	34,98	466	1,53
«Испано» HS-404	20	49,5	10,8	50	542	1,41

As a small commentary on the table, it is worth paying attention to the fact that the UBS machine gun is more powerful than the MG-FF cannon, and between different types of 20-mm cannons there is a threefold difference in power and one and a half - in the value of a second salvo. Now, from considering the parameters of individual types of small arms, let's move on to a review of the total armament of fighters at the beginning of World War II (see Table 8).

Table 8

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	Состав вооружения	Мощность, кВт	Секундный залп, кг	Общий вес оружия, кг
«Р-36» («Хоук-75») Hawk	6*7,7 «браунинг»	390	1,14	60
«И-153», «И-16» (тип 18, 24)	4*7,62 «ШКАС»	392	1,16	44
«И-16» (тип 29), «МиГ-3»	1*12,7 «УБС» + 2*7,62 «ШКАС»	433	1,22	44
«Bf-109» E-3	2*20 MG-FF + 2*7,9 MG-17	492	2,46	78
«Спитфайр», «Харрикейн»	8*7,7-мм «браунинг»	520	1,52	80
«Bf-109» F-4	1*20MG-151 + 2*7,9 MG-17	610	1,99	64
«Моран-Солнье» «MS-406» Morane-Saulnier	1*20 HS-404 + 2*7,5 MAC	672	1,79	70
«Девуатин» D-520 Dewoitine	1*20 HS-404 + 4*7,5 MAC	802	2,17	90
«И-16» (тип 17, 27, 28)	2*20 «ШВАК» + 2*7,62 «ШКАС»	1 016	3,14	106
Блох «MB-152» Bloch	2*20 HS-404 + 2*7,5 MAC	1 214	3,20	119

The table shows the data of the most weakly armed variants of the "seagull". In fact, I-153 fighters were produced in 1939–1940. with various combinations of weapons, including two "UBS". In this version (2 UBS + 2 ShKAS), the “hopelessly outdated” biplane was superior in terms of weapon power (670 kW) to the German Messerschmitt of the E or F series. The second remark refers

to the Focke-Wulf. Of course, he has nothing to do with the beginning of the war. We cited the armament parameters of this, probably one of the best piston fighters of all time, in order to clearly see the “big leap” that took place in the armament of fighters in just 5–6 years. From 1938 to 1944, the weight of airborne weapons increased five times (and this is without

taking into account the increase in the weight of ammunition!), The weight of a second salvo increased seven times. The huge efforts aimed at increasing the armament of fighters most likely indicate that the fighters of all countries met the beginning of the world war with completely unsatisfactory small arms. Most likely, it was precisely the ineffective, inappropriate weaponry that was the reason that even in the days of the most intense battles of the “Battle of Britain”, when “clouds” of German

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bombers, for one downed enemy aircraft, 25-35 fighter sorties were spent.

The most surprising thing is that, with all the desire, it is impossible to find at least some connection between the performance characteristics of weapons and the results of air battles and air warfare in general. The weakest was the armament of the American fighter "Curtiss" "P-36" (it was supplied to France under the name "Hawk-75"). But it was this fighter in May - June 1940 that turned out to be the leader in the number of downed German aircraft! Of the 25 French Air Force fighter groups, as of May 10, 1940, only 4 were armed with Hawks (later another group was re-equipped with Hawks). But of the total number of 684 reliable victories, the pilots of the Hawks accounted for more than one third (230 shot down). Of the 11 pilots who shot down 5 or more German aircraft, 7 flew Hawks. On the other hand, the “absolute champion” in all three indicators (second salvo, total power, muzzle energy of the projectile) was the French Bloch MB-152 fighter, which by no means proved to be the “king of the air”. In the face of these facts, it remains only to repeat once again the common truth: it is not the planes that are fighting, the pilots are fighting ...

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Chapter
10 DYNAMIC MODES

Between the detection of an enemy aircraft (an action, the probability of which practically did not depend on the performance characteristics of a fighter) and the opening of fire to kill, there is a stage of combat maneuvering, the success of which, of course, depends on the flight parameters of the aircraft. The task of this stage is to reach a position convenient for conducting aimed fire. As already mentioned, such a position is approaching the enemy from behind or behind-from below, as a rule, with an angular deviation of no more than 5 degrees from the axis of movement of the enemy aircraft. (45, p. 67) Shooting at high angles required a quick and accurate determination of the lead value, which, in the absence of any guidance automation devices on the aircraft at the beginning of World War II, was practically inaccessible even to highly qualified pilots.

> "When studying the methods of combat, as a result of which the enemy suffered losses, it turned out that the most advantageous were the attacks carried out by our fighters from above and behind and below, i.e., attacks carried out with a maneuver in a vertical plane and entering a firing position from the rear hemispheres ... The number of enemy aircraft shot down at the same time averaged 80-85% of the total number shot down in air battles ... "
>
> ***(31)***

In the Soviet Air Combat Manual of 1943, it was said: ***"The normal firing range, providing a good hit probability, is not more than 100 m."*** The statistics of 1945 looks like this: 50% of the total number of downed enemy fighters were destroyed by fire from a distance of less than 100 m, another 39% - from a distance of 100 to 200 m. At a distance of more than 300 m, only 1% of the total was shot down. According to the memories

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Soviet fighter aces, many of them preferred to shoot almost point-blank, "when the rivets become visible." Among other things, firing from extremely short distances softened the requirements for angular deviation - the enemy aircraft “ran into” the tracks even with significant errors in the choice of lead value. Thus, energetic and skillful maneuvering could largely compensate for the weakness of weapons and the primitiveness of aiming devices. It is clear that the quality and ultimate effectiveness of maneuvering

depend to a large extent on the qualifications and combat experience of the pilot. Less obvious is that the most effective "manoeuvre" is a well-organized group combat tactic. The more and better the commander thought out all the details of the upcoming battle, the less his subordinates would have to “twist the loops”. The optimal formation of battle formations, separation in height, the allocation of shock, covering, reserve groups, the use of clouds and the sun, interaction in group combat - all this ultimately allows you to succeed in a swift first attack, without being drawn into a spectacular on-screen, but ineffective in combat "aerial acrobatics". "You don't have to figure." These words are attributed to the fighter pilot, lieutenant general of aviation, Hero of the

Soviet Union, commander in chief of aviation P.V. Rychagov. If he really said that, then he was absolutely right. The war, in which General Rychagov was not destined to fight his enemies face to face, fully confirmed this simple rule.

> “The experience of the Great Patriotic War showed that the first attack always gave the greatest result, for the reason that in it the element of surprise is most likely ... Examples of the actions of a number of fighter aviation divisions in various major operations carried out by our troops in the period 1944-1945 show that from the first attacks, up to 75% of German aircraft were destroyed ... A simultaneous attack carried out by several aircraft was the highest level of air combat ... The execution of an attack by a group had a lot

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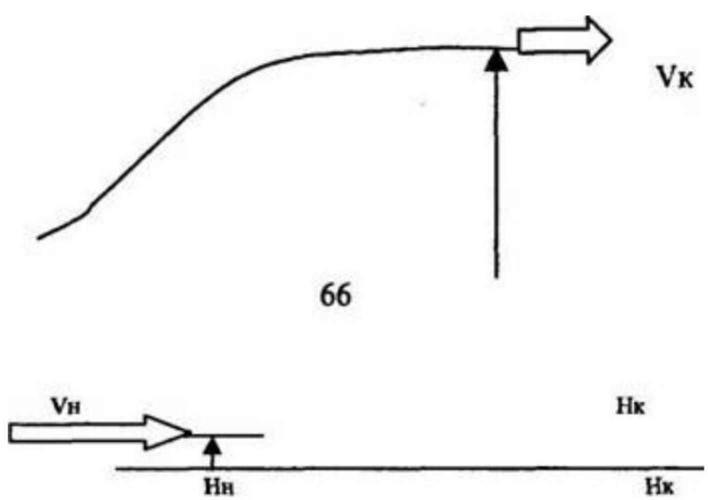
positive, since the power of the fire of several aircraft and the moral impact produced on the enemy, as well as the feeling of comradely support of the fighters simultaneously attacking, made the attack by the group extremely effective ... "

(31)

And only after the air battle broke up into separate individual fights, the turn came (if it came) for what they like to discuss so much on all kinds of Internet forums: for competition in speed and maneuverability

aircraft.

Of course, the outcome of this competition also depends on the performance characteristics of the aircraft. But not only, and not even so much from them. Air combat fighters do not fly as described in our Chapter 2. Combat aircraft maneuver in what are called "dynamic modes." This is a flight mode based on the continuous conversion of the aircraft's kinetic energy (propulsion energy) into potential energy (positional energy) and vice versa. Or, in other words, turning speed into height and height into speed. The simplest example of this conversion of speed into climb is the "hill" maneuver (see Figure 9).



Rice.

9 Based on the fundamental law of conservation, the sum of the kinetic and potential energies in the initial and final states must be equal to each other.

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$$0{,}5\cdot(V_{H}^{2}-V_{K}^{2}) = g\cdot(H_{K}-H_{H})$$

For example, a jet aircraft was flying at an initial speed of 2340 km/h (650 m/s). Due to the loss of speed to the evolutionary (i.e., such a minimum allowable speed at which the effectiveness of the aerodynamic rudders is still maintained) equal to 360 km / h (100 m / s), it can rise to 20854 m. Of course, this calculation is not takes into account the effects of both aerodynamic drag and the thrust of a running engine, so it is provided for illustration purposes only. A real example would be the Soviet MiG-25 fighter, which is capable of performing a 15 km dynamic slide from a static ceiling height of 20 km to 35 km.

Now let's move on from abstract examples to parameters WWII fighters.

"Instructions for the pilot on the operation and piloting technique of the La-5 aircraft with the M-82 engine" of 1943 ordered to produce a slide as follows:

> "After the aircraft has accelerated to maximum speed, smoothly pull the stick towards you and set the climb angle to about 60 degrees. Upon reaching a speed of 270 km/h on the instrument, gently press the aircraft into level flight or turn with a slight roll of 15–20 degrees with the handle. in the desired direction, making sure that the speed is at least 250 km / h ***(this is the evolutionary speed for La-5).*** Climbing up the hill about 1000 m. Execution time 12–15 seconds"

Climb 1000 meters in 12-15 seconds on dynamic hill means reaching a vertical speed of 67–83 m/s. Vertical speed 67–83 meters per second. It's not a lot, but an incredible amount. If we look at those performance characteristics of fighters from the beginning of World War II, which are given in all books and reference books, we will find that a typical fighter developed a vertical speed of 12-14 m / s (700-850 m / min). A vertical velocity of 10–11 m/s could be considered unacceptably low, and an exceptionally high vertical velocity of the order of 15–17 m/s. At the end of the war, the huge efforts of designers and

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scientists created fighters capable of developing a vertical speed of 19–22 m / s (La-7, Spitfire Mk-XIV, Messerschmitt Bf-109G-10). Moreover, all these values refer to the so-called "initial" vertical speed or "vertical speed near the ground." As the climb and the associated drop in thrust of the propeller installation, the vertical speed rapidly decreases. Thus, the vertical speed of the La-5FN fighter near the ground was 17.7 m/s, at an altitude of 5 km it decreased to 14 m/s, and already at an altitude of 7 km it dropped to 10 m/s.

The fighters of that era achieved high vertical speed and the ability to "soar into the sky" ONLY in dynamic modes. For example, in the operating

instructions for the LaGG-3 (the same fighter that was called the Lacquered Guaranteed Coffin on all fronts), the recommended climb angle when performing a figure called “ranversman” (a combination of a slide with a turn and subsequent dive) is called an angle of 70–80 degrees to the horizontal. But this is not the limit of the possible dynamic rate of climb. The indicated modes of performing a slide or a ranversman assumed that the execution of the figure begins from a horizontal flight at maximum speed. But it is also possible to fly at a higher speed - with the speed of a dive. For LaGG-3, this is 600 km / h, Yak-3 dived at a speed of 700 km / h. Moving from such a speed to a dynamic slide, one could really “soar into the sky like a candle”.

On the other hand, all books and reference books, all "plates" give the values of vertical speed in the "static" mode of climb, i.e. in flight with a constant horizontal (relative to the ground, and not relative to the air flow) speed. Optimum speed during static climb for a variety of aircraft designs (LaGG-3, La-5, Yak-3, Kittyhawk, P-40, Messerschmitt, BM09 G-2) operating instructions call approximately the same speed of 270–275 km / h. With such values of horizontal and vertical speeds, a static climb occurred: for "hopelessly outdated" fighters like the English "Hurricane" or the French "Flea" "MB-152" at an angle of 6–7

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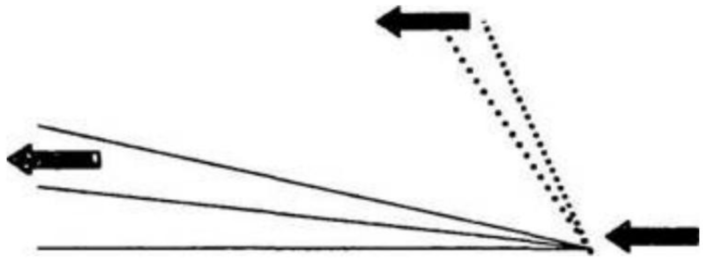
degrees to the horizon, and the newest Spitfire or Messerschmitt - at an angle of 12-13 degrees to the horizon. Neither one nor the other, not 6 or 13 degrees, has anything to do with vigorous maneuvering in air combat.

Typical climb trajectories of typical World War II fighters in static and dynamic modes are shown in Fig. 10



Rice.

10 Dear reader, look at fig. 10 as carefully as possible. He deserves it. In the previous chapters, we noted a real, indisputable FACT: flying on exactly the same aircraft, some pilots shot down dozens of enemy aircraft, while others (and there were an absolute majority) did not shoot down a single aircraft during the entire war. Rice. 10 is a graphic explanation of one of the many reasons that explain this fact. Rice. 10 shows that in aerial maneuvering, almost everything depended on the tactics of organizing the battle (early climb and suddenness of attack) and the pilot's individual skill (the ability to fly in dynamic modes).

> The rate of climb, as well as the speed, is very much dependent on the excess. If the fighter is at the top, then after a dive attack, it can give a huge rate of climb for a short period and go up an extremely steep hill. The pilot, seeing the "Me-109", slipping past him at high speed and leaving with a
>
> candle up, sometimes does not take into account that all this is achieved not so much due to the qualities of the aircraft, but due to tactics, due to the advantage in altitude, which gives a sharp increase in speed and rate of climb ...

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(Manual on conducting air combat 1943)

The dynamic slide, which makes it possible to increase the real rate of climb of a fighter by a factor of 5–6 compared to the static climb mode, is not the only type of dynamic mode of combat maneuvering. Speed (i.e., the reserve of kinetic energy) can be turned not only into climb, but also into "additional engine thrust", which sharply increases the horizontal maneuverability of the aircraft.

> Combat turn. To perform a combat turn, accelerate the aircraft to maximum speed. Enter the aircraft into a combat turn with a roll of 15–20 °; simultaneously increase the climb angle and smoothly give full throttle. Take the aircraft out of a combat turn into level flight at a speed of 280 km/h with the engine running at full power. After exiting the turn, slow down the gas to normal. When performing a combat turn, the aircraft gains a height of 800 m.

What is the physical meaning of this maneuver? The kinetic energy accumulated before the start of the combat turn ***(“accelerate the aircraft to maximum speed”)*** is subsequently spent on overcoming the aerodynamic resistance that increases sharply during flight with high angles of attack. school physics teachers really dislike the mention of this force that does not exist in nature). In addition, due to a significant drop in speed (from a maximum of 500-565 km / h to 280 km / h specified in the instructions), a climb is simultaneously provided on a combat turn (i.e., an increase in potential energy, which in the next second of the battle can be again turn into a speed boost while diving). Full of the huge possibilities of dynamic modes (“huge” - this means improving the characteristics of maneuverability not by a percentage, but by several times) is by no means simple. In addition to the fact that the pilot is required to have a

high flight and usage

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physical training, again, appropriate tactics of combat use are needed. First of all, it is necessary to

ensure an excess (it was the height that was the main "energy accumulator" for the fighters of that era) over the enemy even before meeting him. Secondly, it was desirable - although this did not always correspond to the task set - to transfer the battle from low to medium altitudes. The fact is that you can accelerate on a dive very strongly, but in order not to crash into the ground, you needed a very significant margin of height. Thus, the LaGG-3 piloting instruction warned the pilot that ***"when diving at an angle of 60 ° and reaching an speed of 600 km / h according to the instrument, the aircraft loses 1400 m of altitude during the withdrawal."*** "Messerschmitt" "Bf-109" G, with a maximum allowable overload of 4 units, to get out of a dive at a speed of 750 km / h, a headroom of at least 1100 meters was needed. Thus, a fairly effective (and effectively described in all memoirs) method of conducting air combat: "accelerated in a dive - fired - went up with a candle" - was good in sky-high battles over the English Channel. The fighting on the Eastern Front required fighters to descend to the heights at which the attack aircraft of the battlefield operated, i.e., to low and extremely low altitudes, where all participants in air battles had to switch to horizontal maneuver at low speed and high overloads. The second most important "energy accumulator" is the high speed of horizontal flight. But the aircraft cannot fly at maximum speed for a long time - there are restrictions on the supply of fuel, due to

which, in order to ensure maximum patrol duration (or maximum bomber escort range), it was necessary to fly at cruising speeds, which, as a rule, are 50–60% of the maximum (270–280 km/h for LaGG-3, 300–320 km/h for La-5). Thus, the real speed with which the fighter entered into a real air battle was to a large extent determined not by the power of the engine, not by aerodynamic tricks, but again by tactics. A fighter patrolling at a speed of 300–350 km/h turns from a fighter into a target. Serial testing

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the La-7 aircraft showed that the acceleration rate is only 94 km / h per minute (at an altitude of 5 km, with an initial speed of 460 km / h). And this, mind you, is with the La-7, that is, with one of the best piston fighters in the world. In other words, it took a typical fighter jet about 150 seconds to accelerate from cruising speed to maximum speed. The air battle during this time could already be over ...

The influence of the performance characteristics of an aircraft on the ability of a fighter to maneuver in dynamic conditions is very complex. We will try to note only some aspects that are relevant in a popular book for the

humanities. The implementation of dynamic maneuvering modes requires low aerodynamic resistance (so that kinetic energy is not wasted on air heating), i.e., a sharp nose, a thin wing of a small area (i.e., a large specific load). Most likely, an aircraft with a high maximum flight speed has such properties - but by no means always (high speed can be obtained on a "log" with a very high thrust-to-weight ratio, on a high-altitude engine). A more plausible estimate is based on the maximum dive speed - if the aircraft can accelerate to high speeds, then it effectively converts altitude into speed (potential energy into kinetic energy). But even here, not everything is simple - the maximum allowable dive speed can be limited by the stiffness and strength of the wing (flutter). The second most important condition for converting speed into a maneuver (vertical or horizontal) is a low evolutionary speed (the efficiency of a dynamic

maneuver, as already shown above, is determined by the difference between the squares of the maximum and evolutionary speeds). In parentheses, we note that for many years of work, the author has never come across a popular book in which these parameters would be indicated. Indirectly, the magnitude of the evolutive speed can be judged by the landing speed close to it and also by the presence of slats (if they are, then the angles of attack acceptable under the stall conditions will be greater, respectively, the evolutive speed will be less). Although this issue is very difficult. Small evolutionary speed is related

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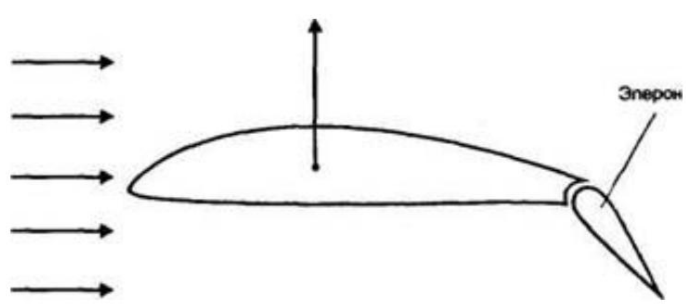
first of all, with a small specific load, i.e. with a "large wing", but a large wing will prevent dive acceleration.

There are also quite unexpected effects. The slats, of course, increase the permissible angles of attack, but the British, testing the captured Messerschmitt in June 1940, discovered such a strange feature in it: when maneuvering with high overloads and at high angles of attack, an asymmetric release of automatic slats on the right and left wing occurred, which led to "yaw" (quick and random changes in flight direction) and made it impossible to aim fire.

In all previous discussions, we considered the aircraft as a material point flashing in the sky under the influence of various forces. But the aerodynamic forces acting on this "point" depend on the angles of rotation of the wing and fuselage around the center of mass. These turns are by no means instantaneous, angular speeds are limited both by design features and by the maximum effort with which the pilot pulls and presses on the handle and pedals. We would not want to bore the reader beyond measure, but without consideration of controllability issues, all assessments of the possibilities of dynamic maneuvering lose their practical meaning.

In order to turn around, the aircraft must bank (see Chapter 2 for more details). In order to roll, you need to raise the aileron on one wing, and lower it on the other (this is done with one movement of the control stick to the left or right). Possible further events are reflected in fig. 11 and fig. 12.



Rice. eleven

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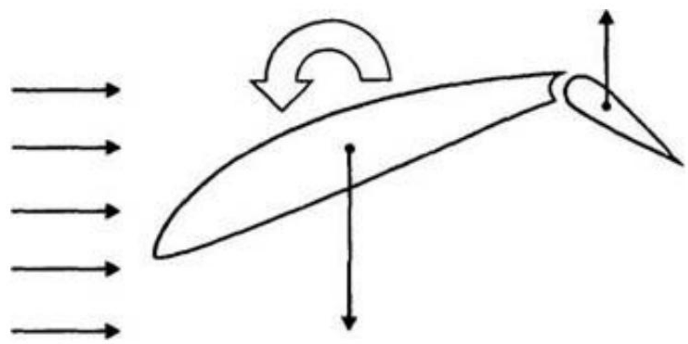

Rice.

12 Deflection of the aileron down leads to an increase in the curvature of the wing profile, the air pressure under the wing increases, and as a result, an additional upward force appears (see Fig. 11). On the other wing, at this time, everything is the same, only in reverse (the aileron deflects upward, the pressure under the wing decreases, and above the wing it increases, as a result, an additional aerodynamic force directed downward appears). The plane rolls and goes into a turn. But the wing is a thin plate, by no means "infinite rigidity". Under the influence of the aerodynamic force that “raises” the aileron, the wing begins to twist, and the angle of attack (the angle between the air flow velocity vector and the wing) decreases. (see fig. 12). As a result of this complex interaction, the effectiveness of the ailerons at high flight speeds begins to decrease to zero, and then the so-called "aileron reverse" occurs - the aileron deviates downward, and the wing lift not only does not increase, but, on the contrary, falls! At the same time, the aircraft begins to roll in the wrong direction where the pilot wants to roll it (although in practice it does not reach such a state, and the process ends at the stage of complete loss of lateral controllability of the aircraft). The ability to quickly create a roll (high roll angular velocity) is the most important indicator of aircraft combat maneuverability.

For example, an enemy fighter is already "hanging on its tail" and preparing to open fire. At the same time, it is the ability to very quickly create a roll and “leave the track” that determines the survival of the attacked aircraft. In the early 1940s, an angular roll rate of about 90 degrees per second was considered necessary for combat maneuvering (in other words, performing a full “barrel” in 4 seconds or entering a sharp turn with a bank angle of 70-80 degrees for one

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seconds). World War II fighters maintained such controllability only at speeds significantly (one and a half to two times) lower than the maximum. For example, the Yak-3

performed a full "roll" in 5-6 seconds at a speed of 350 km/h, the Spitfire maintained a high (90 deg/s) angular velocity up to a speed of 400 km/h (a fantastic result for an aircraft with very thin wing - R. Mitchell clearly knew some magic word ...). Best of all Soviet fighters twisted the "barrels" "La-5". The Germans, having tested the captured La-5, were amazed at the effectiveness of the Lavochkin ailerons. ***(“Aileron efficiency is outstanding. At a speed of 450 km / h, a complete revolution is completed in less than 4 seconds”),*** which even surpassed that of the Focke Wulf FW-190 (which significantly surpassed the Messerschmitt in this most important indicator).

In addition to the ailerons, the aircraft also has elevators (mounted on the stabilizer) and rudder (mounted on the keel). The keel and stabilizer are much shorter than the wing and therefore have a much higher torsional rigidity. Tail rudder reversal usually does not happen, but problems with excessively high stick and pedal forces at high airspeeds inevitably arose - to a greater or lesser extent - on all World War II fighters. Things were especially bad on the Messerschmitt - at speeds of more than 450 km / h, this "best fighter of the war" turned into a practically unguided projectile ... I would like to hope that after this very short "educational program" it has already become clear to the reader

that the logic itself is traditional for the Soviet military-historical literature assessing the quality of fighters on a single indicator (maximum speed) is absurd. Absolutely absurd. In 1941, the MiG-3 was the fastest and the I-16 the slowest fighter that fought in the skies of war. At the same time, just as the first of them was not the best, the second was not the worst in the totality of its combat capabilities. Maximum speed at high altitude is only a small part of the totality of aircraft flight parameters. Aircraft flight parameters (along with incomparably more

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important ability of the pilot to realize the possibilities of dynamic flight modes) are just one of the prerequisites for successful maneuvering in combat. Maneuverability (understood in the broadest sense of the word, as the ability to get close to the enemy and take a comfortable position for firing) is (along with armament parameters) only one of the components of the tactical and technical characteristics of a fighter. The high performance characteristics of aircraft (along with the incomparably more important choice of optimal tactics for combat use) are just one of the components of the overall effectiveness of fighter aircraft.

The chapter ends with conclusions. We will quote them verbatim and in the order in which they were listed at the end of the 1943 Air Combat Manual.

conclusions

1. The outcome of the battle is decided not so much by the qualities of the aircraft as by the ability to use them, that is, tactics. In this case, the fighter pilot must be able to obtain from the aircraft the maximum rate of climb, the maximum flight speed, the maximum climb on the hill and the minimum turn time. 2.

The fighter is not suitable for passive defense, so you must always act first, achieve surprise, at least the first attack, and retain freedom of action. 3. Correctly build a battle formation, echeloning it in height. It is

necessary to allocate a cover group, using it as security and reserve. 4. Exceeding in combat increases speed and rate of climb, and thus provides

freedom of action and initiative for fighters ...

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Part 2
THE EVE

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Chapter 11 "TRIUMPHAL MARCH" IN NUMBERS

The conclusions with which we ended the previous chapter, most likely, did not satisfy the reader who was educated and “savvy” at the lectures in the Lenin Room. He will not let idle reasoning confuse him. He remembers exactly that the Messerschmitt flew faster. And that's why everything (that is, the catastrophic defeat of the huge Soviet Air Force) happened. And the talk that ***“the outcome of the battle is decided not so much by the qualities of the aircraft as by the ability to use them”*** is just “rotten excuses” designed to obscure the technical backwardness of Soviet aviation. The educated reader is

absolutely right. In one. The Messerschmitt really flew faster than the donkey. Over the entire range of altitudes, from the ground to cirrus clouds. And the author has not the slightest doubt that the Messer would have taken first place in air racing competitions. In the same way, the author has no doubts that the duel - if only this duel is organized according to the model of an honest "knight's tournament" - will win "I-16". In fact: at the command of the “herold”, two aircraft (“Messer” and “donkey”) rushed towards each other. Who flies faster in such a situation is absolutely not important - only the total speed of approach is important. In a frontal attack, the I-16 pilot is protected by a reliable "shield" - an air-cooled star-shaped engine. And on the nose of the "Messer" is a liquid-cooled motor, which fails after the first hole in the cooling jacket, in radiators or water pipes. The “spear” is longer than the “donkey” (the initial velocity of the projectile of the Soviet ShVAK cannon is almost one and a half times higher than that of the German MG-FF projectile). In short, the Messer has no chances in a frontal attack. Which, by the way, has been repeatedly confirmed in real battles.

But this book is not written about sports competitions and not about jousting tournaments. This is a book about war, and in this chapter we will consider the events of the first major battle of the era

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Second World War. Of course, we are talking about air battles over France in May-June 1940. True, the events of those tragic days are known to the Soviet reader under a different name. No “battles,” let alone major ones. ***“The Second World War became a war in the true sense of the word only starting on June 22, 1941. Prior to that, it was a triumphal march of Nazi divisions across Europe.*** Among Glavpurov's "historians" it was simply considered good form to "kick" the allies, remembering them only as an example of helplessness and failure. Sometimes things reached the point of complete absurdity. So, in the only fundamental work on the history of the Luftwaffe in Soviet historiography (published in 1967, author D. D. Gorbatenko), somewhat understated figures for the losses of German aviation in France and Norway (1239 aircraft) were given with the following caveat: “in general, ***these losses did not seriously affect the combat capability of the Luftwaffe.*** That's it. More than a hundred squadrons of downed aircraft "did not seriously affect the combat effectiveness of aviation." Happens. However, after a few pages, the author informed readers that 1284 German aircraft destroyed in the first month of the war with the USSR became such losses " ***that German aviation had not known since the very beginning of World War II" ...***

The objective preconditions for the attack on the Anglo-French allies to become a "triumphal march" for the Wehrmacht were created in Moscow in August-September 1939.

On November 23, 1939, while encouraging his generals before the big offensive on the Western Front, Hitler had every reason to declare that ***“what we have wanted since 1870 and actually considered impossible has happened. For the first time in history, we have to fight on only one front, no other front is holding us back now ... ”The*** “ Other Front ”(i.e., the Soviet Union) seemed to Hitler - and in fact turned out - so safe that the German command was able to concentrate for invasion of France, almost all available forces, including almost all aviation. From the air defense districts of Königsberg (Kaliningrad), Breslau (Wroclaw), Dresden, Nuremberg, Vienna, all fighters were removed to one. The headquarters of the 3rd fighter squadron and one of its fighter groups (II / JG-3) were left in the Berlin air defense zone, a total of 49 aircraft, of which

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39 serviceable as of May 10, 1940. Moreover, when the Germans had problems with gasoline on the 15th day of the offensive, Comrade Molotov consoled the German ambassador in Moscow, Count Schulenburg, by saying that “the ***question of the desired amount of oil products does not raise objections from the Soviet side ... all the proposals of the German government are accepted. Full consent given. With the current operations, both gasoline and gas oil are really needed for the German army, whose actions are remarkably successful ... ” (69,*** p. 287) Under such conditions, on May 10, 1940, the Germans managed to create the largest grouping of Luftwaffe forces on the Western Front during the Second World War.

world war. The invading armies were to support the 2nd Air Fleet (commander Kesselring) and the 3rd Air Fleet (commander Sperrle). 27 fighter and 40 bomber air groups (regiments), 9 groups of dive bombers "Ju 87" and 9 groups of multi-purpose twin-engine "Me-110" were concentrated in the offensive front line of 250-300 km. A total of 3641 combat aircraft (and this is without taking into account the obsolete Arado Ag-68 and Henschel Hs-123 biplanes, without taking into account transport, sanitary, reconnaissance aircraft). Of the 27 fighter groups, 26 were completely re-equipped with Messerschmitts of the latest at that time modification E.

Is it a lot - 3641 combat aircraft as part of 85 air regiments?

Everything is relative. For us, the

most important is the comparison with June 22, 1941. On that day, for the invasion on a front of 1,400 km (in a straight line) from Riga to Odessa, the Germans could not allocate at least the same number of combat aircraft as on May 10, 1940 supported their attack on a front of 300 km from Arnhem to Saarbrücken from the air. (See Appendix 3) Only once, in the summer of 1944, did the size of the Luftwaffe grouping on the Eastern Front become comparable (3267 aircraft) to the level of May 1940 in France...

What could French aviation oppose to such an air armada? Could do a lot. After all, France was the oldest aviation

power in the world. And although the Wright brothers were Americans and they made and tested their plane - the first in the world - in the USA, France's contribution to

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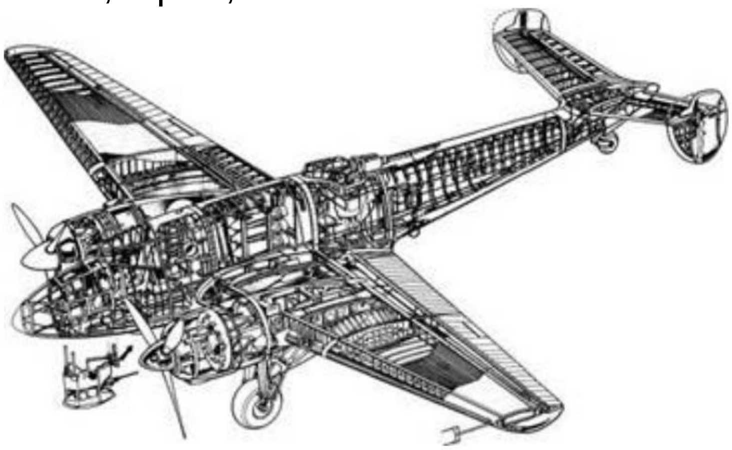
The formation of aviation at the beginning of the 20th century was enormous. It is no coincidence that the generally accepted terms - "fuselage", "chassis", "spar", "aileron" - are taken from the French dictionary.



"LeO-45"

Surprisingly little was done. However, there is nothing to be surprised here. For two interwar decades, France was engaged in creativity. “Architectural” creativity (most of the military budget was spent on the construction of the Great French Wall - the “Maginot Line”, which, according to its creators, was supposed to replace the absence of the English Channel on the border with Germany), technical creativity (a great many experimental and small-scale aircraft, many of which were very original in design), “literary” creativity (for example, the technical description of the LeO 4 bomber was designed in this style: “when the pilot gives full throttle, the attacking fighter will expose itself directly to the cannon, which will not ***be interfere with the two-keel plumage ... "),*** social creativity (the government of the Popular Front, an agreement on cooperation with the USSR, a legal mass communist party). The latter(s) backfired most loudly when, in September 1939, the French Communist Party, having received another directive from its Moscow landlords, began to organize strikes at military factories and stigmatize "Anglo-French warmongers who do not want to heed Hitler's peace proposals." To tell the truth, soon after that the Communist Party was formally banned - but not in the same way, not at all in the way that the enemy parties and organizations were "banned" in the "homeland of the lamenting of the whole world" ...

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More than strange views on the role and place of military aviation became another fruit of creative searches. In the general framework of passive defensive (which found its concentrated expression in the construction of the "Maginot Line") aviation was considered an appendage of the ground forces. Its main tasks, in accordance with the "Instructions for the tactical use of large air formations", were considered "covering the attack, reconnaissance and transportation of ground troops." Moreover, despite the presence of the relevant instructions, there were no “large air formations” themselves, like the German air fleets or Soviet air corps. Despite the operational subordination of aviation to ground forces, the French Air Force did not have a single model of close fire support aircraft like the German dive Junkers Ju-87 or the Soviet armored attack aircraft Il-2. The situation was aggravated by the completely ridiculous air force basing system. The military doctrine, based on the idea of positional defense,

simply did not involve the active redeployment of aviation from one airfield to another. Each connection was considered, as it were, stationary, “tied” to its own airfield. In the event of a forced flight to another air base, the air group was automatically part of the formation to which this airfield was assigned, and the rear services remained in place with all their regular equipment. As expected, in the situation of the "blitzkrieg" imposed by the Germans, this entire cumbersome system of logistic support for aviation quickly collapsed.

The state of the French aviation industry was quite consistent confusion in leadership areas.

A.S. Yakovlev writes in his memoirs: ***“Every time I looked at the aviation factories of France, I involuntarily compared them with ours. And each time, with deep satisfaction, I came to the conclusion that in terms of scale, in terms of the quality of equipment, not one of the French enterprises I saw could be compared with any of our ordinary aircraft factories.*** A clear illustration of the state of aviation production in France can be considered the following phrase by Louis Breguet, the head of the largest French aircraft manufacturing company (to this day producing together with

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firm "Dassault" jet "Mirage"). In a report on his trip to the USSR, which took place in 1936, he wrote: "Using the labor of ten times more workers than France, the Soviet aviation industry produces 20 times more aircraft." Of course, a visit to the factory floor cannot provide exhaustive information about production volumes, so Mr.

Breguet was mistaken. But not as much as a reader accustomed to moaning about the "unpreparedness of the Soviet Union for war" might think. In the last pre-war year (1938), the average monthly production of military aircraft in France was only 49 aircraft, and in the USSR - 458 (in particular, 1173 I-16s, 1427 SBs and 399 DB-3s were produced that year).). As a result of such “work”, by the beginning of World War II, the French Air Force was armed with only 1,400 combat aircraft (the Soviet Air Force, as mentioned above, had 12,677 combat aircraft by October 1, 1939), and almost 40% of the French Air Force fleet were aircraft -scouts. By May 10, 1940, bomber aviation on the territory of continental France consisted of about fifty modern LeO-45 bombers in combat-ready condition, as well as about three hundred completely obsolete, and even different types of "bombers" created in the early 30s. Thus, practically the only effective component of the French Air Force was a fighter

aviation.

The main type of pre-war French fighter was the Morane-Saulnier MS 406. The history of this aircraft began in the autumn of 1934, when competitive conditions were announced for a new single-seat French aviation fighter. On August 8, 1935, its prototype took off. The production of "Moran" unfolded very slowly. Until the end of 1938, the French Air Force received only 27 (twenty-seven) first production aircraft. The peak of production came in 1939 - 932 Moranas were delivered to the troops. In total, taking into account the release of 1940, the French Air Force received 1098 aircraft of the Moran-Saulnier models - 405/406.

From their peers - sharp-nosed fighters born in 1935 with liquid-cooled engines and retractable landing gear (Messerschmitt, Spitfire, Hurricane) - Moran

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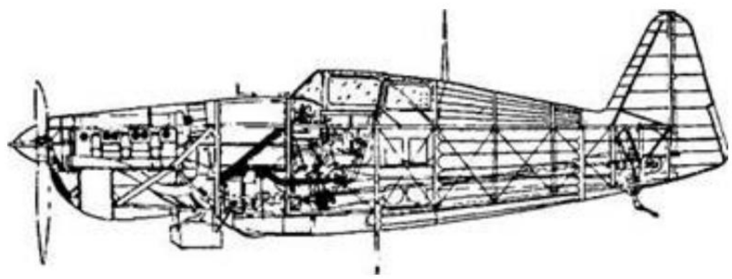
differed in a slightly smaller size and weight, and also advanced weapons: it was the first mass-produced fighter armed with a cannon installed in the collapse of the engine block, i.e. along the axis of the aircraft fuselage. There were plenty of negatives as well. The Moran's gas tank had no protector, the pilot's seat had armored backs (the armor appeared only on the latest aircraft, produced in the late autumn of 1939). High (by the standards of 35–37 years) speed was obtained by using an unusual engine cooling radiator retractable into the fuselage. With the radiator released into the stream, the Moran did not gain even 450 km / h, but with it removed, the engine quickly “boiled”.



"MS-406"

The closest analogue of the "Moran" among the serial Soviet fighters can be called "I-16" cannon modifications (type 17, 27, 28) and "I-16" type 29 (armed with one "UBS" and two machine guns " ShKAS"). According to the parameters of the weapons, the Moran was, as it were, between the I-16 type 29 and type 27/28: the mass of a second volley, respectively, is 1.22 kg, 1.79 kg, 3.14 kg, the total weapon power is 433 kW, 672 kW , 1016 kW (see Chapter 9, Table 8). These aircraft also had a similar total production volume (in the 1938-1940s, 1236 I-16s of the above types were produced). As for the flight parameters, the most massive French fighter was inferior to the "donkey" in almost everything (see Table 10).

Table 10

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	Вес, взл., кг	G/S, г/кв. м	P/G л.с./т	Скорость, max. км/час	Скорость у земли, км/час	Скорость верт. у земли, м/мин
«И-16», тип 28	1 988	136,7	468	485 / 5 км	338	882
«MS-406»	2 470	154,4	304	490 / 5 км		667
«Хоук»-75 A2	2 600	118,2	365	489		930
«И-16» тип 24	1 780	122,4	523	489 / 4,8 км	440	938

Note: in tables 10 and 11, the power-to-weight ratio (P/G) is calculated based on the normal take-off weight and the nominal (not afterburner!) engine operation near the ground. The

Morana engine (by the way, it was the same Hispano-Suiza 12Y-31 engine, (Hispano-Suiza), the licensed version of which, called the M-100, was installed on the Soviet SB bomber, and then, in a forced 30 %, up to a takeoff power of 1100 l / s, a variant called M-105 - on "yaks", "lags" and "pawns") was weaker, and the weight of the aircraft was half a ton more than that of the I-16 ". As a result, the takeoff power-to-weight ratio (P/G) of the MS-406 turned out to be one and a half times less than that of the I-16, which predetermined all other flight characteristics. Yes, thanks to the smaller diameter of the liquid-cooled engine, the “game” with the retractable radiator and, most importantly, the higher specific wing load (G / S), the maximum speed of the Moran was almost brought to the coveted mark of 500 km / h, but for this I had to pay with maneuverability, survivability, low vertical speed.

The French leadership understood that the new fighter, which entered the Air Force in 1939, was already obsolete and inferior in terms of performance characteristics to the aircraft of a potential enemy.

The most effective way to quickly rectify the situation was the purchase of aviation equipment abroad. The choice of the French settled on the American fighter firm "Curtiss" "P-36" with an air-cooled engine (most of the aircraft had a "two-row star" Pratt-Whitney ***R*** -1830). Despite the fact that it cost twice as much as Morans of its own production, the command of the French Air Force did not hesitate to sanction the purchase of an American fighter. First 100

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aircraft under the export name "Hawk-75" entered service with the French Air Force in the spring of 1939, in total, before May 10, 1940, France managed to receive 300 "Hawks". Like all American aircraft, the

Hawk-75 had a traditionally solid takeoff weight. Judging by the specific load (only 118 kg / sq. M), then it was the most aerodynamically “lightest” fighter of its generation (only the Soviet I-153 biplane had a lower specific load - 84 kg / sq. M) " gull"). It would seem that the choice of such a specific load should have led to the creation of a highly maneuverable, but slow-moving aircraft. Indeed, the Hawk had excellent maneuverability and easy control, in particular, a high angular rate of roll, but at the same time it was not inferior in speed to the Moran, despite the fact that the latter had a one and a half times higher specific load. The answer is simple: excellent aerodynamics for an aircraft with an air-cooled engine (the coefficient of passive aerodynamic drag for the R-36 was only 0.0251, and for the I-16 it was 0.035) and a propeller with automatic change in the angle of the blades. These devices (in the development of which the American firms Hamilton-Standard and Curtiss-Wright were recognized world leaders) made it possible to significantly increase the thrust of the propeller installation in all flight modes and, at the same time, free the attention (and one hand) of the pilot of a single-seat fighter from control device for changing the pitch of the propeller. In 1940, there was no such machine on the "Messer", nor on the "sleep". The best thing about the efficiency of the propeller installation is the value of the vertical speed, which in the Hawk-75 even somewhat exceeded the vertical speed of the cannon "donkey". The disadvantages of the "Hawk" include relatively weak weapons (4-6 rifle-caliber machine guns). In general, the American fighter corresponded to the Soviet "I-16" machine gun modifications (type 18, type 24) in the entire set of performance characteristics (See Table 10). A significant difference was only in numbers: in 1938-1939. Soviet Air Force received "I-16" type 18 and 24 in the amount of 1111

aircraft.

A French-made fighter with an air-cooled engine took off on September 29, 1937. Designed

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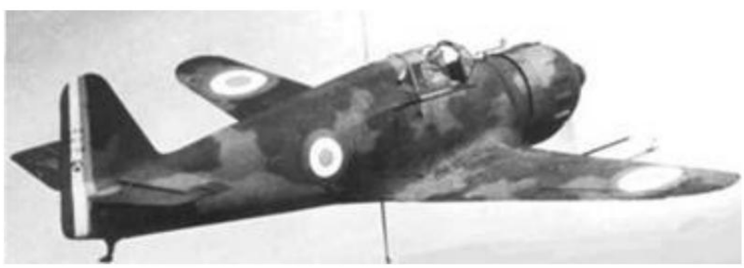
By Avions Marcel Bloch, an aircraft with a “double-row star” from the oldest engine building company, Gnome-Rhone, was conceived at the level of the best world standards. All-metal construction, powerful high-altitude motor, specific wing load over 150 kg/sq. m and strong armament (two 20 mm HS-404 cannons and two 7.5 mm machine guns in the wings) could make this fighter a formidable opponent for German bombers. However, the French engineers failed to cope with the avalanche of technical problems in the time allotted to them by the war. The engine worked extremely unreliably and constantly overheated. The frantic search for the optimal shape of the hood was not successful, and the speed of a long flight due to engine overheating actually did not exceed 470-480 km / h. The control was extremely "tough", and the pilots of this fighter received the derogatory nickname "aircraft for four hands" (avion a quatre mains). To top it off, the French industry could not arrange the production of the required number of propellers, as a result of which hundreds of aircraft stood idle at the factory sites.



"Bloch 152"

The first in the series went to the model "Bloch" "MV-151" armed with 4 rifle-caliber machine guns. On December 15, 1938, the serial MB-152 made its first flight with a GR-14N-21 engine with a take-off power of 1030 l / s. and cannon weapons. When testing the MB-152, a maximum speed of 520 km / h was reached, but problems with overheating of the oil in the engine were not resolved. By the beginning of the war, a total of 249 Bloch-151/152 were assembled, but only 123 of them were handed over to the Air Force - the rest were idle without propellers or were not accepted by military acceptance due to numerous defects. By May 10, 1940, 140 MV-151s and 363 MB-152s were produced, but 47 MV-151s and 146

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"MB-152". For all that, the MB-152 was considered the latest fighter in France, and air groups previously equipped with Morans MS 406 were urgently re-equipped with it. The history of the development and

production of the Dewoitine D-520 fighter was much more successful. On October 2, 1938, the first flight of this - as subsequent events showed - the best fighter of the French Air Force took place. Already in April 1939, the aircraft was chosen as the main fighter, which should replace the obsolete Moran-Saulnier in infancy.

MS-406. Then followed the first order for 200 cars. Having a general layout similar to the Moran, exactly the same wing area (16 sq. M) and the same type of armament (20-mm cannon HS 404 in the collapse of the cylinder block and rifle-caliber machine guns in the wing), the Devuatin-520 had somewhat better flight data mainly for two reasons: a more powerful engine (the same Hispano-Suiza 12Y, but modification 45, takeoff power 935 hp) and much better aerodynamics of the fuselage. Perhaps in this case it would be more correct to say - not as bad as on the ugly, angular Moran.

Be that as it may, this “best French fighter” was inferior to the Messerschmitt of the E series in all flight parameters. Among the Soviet “new types” fighters, the closest analogue of the Devuatin was, of course, the Yak-1, which had a similar layout, the same specific wing load, the same type of armament (a cannon in the collapse of the cylinder block) and the M-105 engine, created on the basis of French "Hispano-Suiza"
12Y. But as of June 22, 1941, there were very few “yaks” in combat units (by Soviet standards, “few”), so it’s worth bringing the performance characteristics of the most massive Soviet fighter of the “new type” - the MiG-3 (see Table 11).

Table 11

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	Вес, взл., кг	G/S, г/кв. м	P/G л.с./т	Скорость, max. км/час	Скорость у земли, км/час	Скорость верт. у земли, м/мин
«МВ-152»	2 750	158,8	316	485		670
«Девуатин»-520	2 760	172,5	308	534		690
«Bf-109» E-3	2 600	159,0	365	570 / 4,5 км	440	769
«Як-1»	2 950	172,0	346	569	472	760
«МиГ-3»	3 350	192,4	338	621 / 7,8 км	474	786

Note: the parameters of the MiG-3 and Messerschmitt are given according to the results of testing serial aircraft at the Air Force Research Institute, therefore they are slightly below the standard.

Comments on table 11 are unnecessary. Even the newest models of French fighters were inferior to both the Messerschmitt and the Soviet fighters of the “new types” in speed, rate of climb, and power-to-weight ratio (hence, in acceleration characteristics). For lack of fish and cancer - fish ... French pilots would have been happy with the Devuatins, but a

large order (2320 aircraft) for this aircraft was agreed in April 1940, that is, a month before the Nazi invasion. By May 10, 1940, only one and only GC 1/3 fighter group managed to completely rearm on the Devuatin-520. Moreover, these 36 (thirty-six) new fighters for some reason ended up in service with the air group that was part of the Alpine Operational Zone ... The ungrateful "history" also let go of the Soviet Union a little time, so before the start of the war only 1289 MiG-3s were produced and 335 "Yak-1", of which only 903 "MiG" and 102 "Yak" were delivered to the combat units of the Air Force of the western districts (not counting the aviation of the fleet). As of June 1, 1941, the new fighters were in service with 19 fighter and 1 reconnaissance regiments. About the existence of the 322 "LaGG-3" "history" is traditionally silent.

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"Devuatin D-520"

In general, the French command was pretty smart in the formation and arming of air units with aircraft. Another specific "strangeness" of French aviation was an unusually large proportion of reserve aircraft. Back in August 1939, during the infamous negotiations of the military missions of the three countries (England, France and the USSR) in Moscow, the French struck Comrade Voroshilov with their opinion that one crew should have two aircraft in bomber aviation and three in fighter aircraft. . (95) In other words, with the outbreak of hostilities in the ranks in the "first line" could be no more than one third of the fighter aircraft that came from industry to the Air Force. Good intentions - to ensure the possibility of continuous and rapid replenishment of losses - led to the

fact that, despite the rapid growth in production volumes (from 200 aircraft in the month of 1939 to 500 aircraft during May 1940), there were significantly fewer French "first line" fighters than it could be. For example, out of 146 serviceable and complete MB 152s that entered the French Air Force, by May 10, 1940, only 93,300 Hawk-75 fighters received from the United States were in service in the “first line”, which went to equip only 4 fighter groups, t i.e. "in the first line" there could be no more than 120 "Hawks". The command of the Luftwaffe, like the entire top leadership of Germany, on the contrary, built its plans on the idea of delivering a crushing first strike, in which all the forces and means accumulated in the pre-war period were invested. Confronted with the passive and expectant strategy of the French

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command, this led to the fact that the “continuous replenishment of losses” planned in Paris never took place - due to the rapid collapse of the French army and state.

The most correct in such a situation, the author seems to estimate the number of French fighter aircraft, based on taking into account the number of main tactical units (and not aircraft, which, in essence, in any Air Force are consumables, similar to a replaceable barrel in artillery). From the end of 1939, an air group consisting of two squadrons of 12 aircraft each began to be considered such a basic unit. Taking into account the headquarters link, a fully equipped French fighter air group could simultaneously lift 27-28 aircraft into the air. In parentheses, we note that the French group turned out to be the smallest tactical unit (the German group consisted of three squadrons and had 40 pilots in the state, the air regiment of the Soviet Air Force - five squadrons, 64 pilots).

On May 10, 1940, there were 25 groups (i.e. 50 squadrons) of day fighters in France: 13 groups on Morans, 7 on Bloch-151/152, 4 on Hawks and 1 group on "Devuatinah". When fully staffed, 25 fighter groups could have 750 pilots and first-line aircraft. Various authors estimate the actual number of combat-ready French fighters in the range from 552 to 784 aircraft.

All fighter aircraft were distributed over four operational air zones (Zone d'Operations Aeriennes) as follows: - 11 groups in the Northern zone; — 6 groups in
the Eastern zone; - 2 groups
in the Southern zone (Dijon
region, about 300 km from the front line); - 6 groups, including one Polish,
in the Alpine zone (Lyon region, more than 500 km from the front line). Thus, only 17 fighter groups (34
squadrons), i.e., about 450-500 fighters, were deployed directly in the area of \u200b\u200bthe hostilities that began on May 10, 1940.

Everything is relative. Returning to table 9, we see that on May 10, 1940, the Luftwaffe had 27

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groups (81 squadrons) of fighters, armed with 1226 "Messers". In addition, there were 9 more groups of twin-engine "Me 110". These were, of course, heavy and clumsy "semi-fighters", however, taking into account the performance characteristics of the French Morans, it is also not worth discounting the 319 Me-110. Thus, for every French there were 2-3 German fighters. And more than two thousand German bombers, which were in fact the main object, on the destruction of which the French Air Force had to concentrate their frail forces. Theoretically, the grouping of French fighter aircraft in the theater of operations could be

strengthened by redeploying another 8 fighter groups from the southeast of the country. It turned out to be impossible to do this in practice. And it's not just about the "stationary" system of basing and material support for aviation (as mentioned above). Comparing the situation in which France and the USSR found themselves after the Nazi invasion, we must not forget another important factor - geography. The main centers of aviation, motor, tank production of the Soviet Union before the war: Moscow, Leningrad, Kharkov, Voronezh, Gorky, Perm, Stalingrad, Rybinsk, Sverdlovsk - were located at such a distance from the western borders, which made them practically inaccessible to German aviation. And France had a completely different geography. Large industrial centers and the most important ports - Paris, Rouen, Le Havre, Reims, Dijon, Lyon, Marseille - were located at a distance of 200-300 km from the border. And this meant that German and Italian bombers could not only fly to them with the maximum bomb load on board, but also fly with fighter escort along the entire route. This threat forced the French command to reduce the already small front-line aviation, transferring fighter groups to the air defense system of large cities. As a result, of those 17 fighter groups that were part of the Northern and Eastern Operational Air Zones, in fact, only 13 were on the front of the invasion that began on May 10 (7 groups on Morans, 4 on Hawks-75 and 2 on " Bloch-152").

Four groups armed with the "newest" "MB-

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151/152 "provided the air defense of Paris, Rouen, Le Havre and Calais. In other words, the 3,500 combat aircraft of the Luftwaffe in the first days of the war were opposed by less than 400 fighters of the "first line" of the French Air Force. Incredibly, this is how the once great aviation power approached the turn of fatal trials. Moreover, already from the end of May 1940, the completely demoralized French command began relocating aviation from the south of the country - but not to the front, but to North Africa ... Another thing is even

more incredible - in a completely hopeless situation, the French pilots inflicted heavy losses on the enemy. On the first day of the invasion, May 10, 1940, 304 German aircraft were shot down, including 104 bombers (51 Non-111, 26 Do-17Z, 18 Ju-88, 9 Ju-87 ").

Losses among the crews amounted to 607 people killed and missing, 133 wounded. For a better

understanding of the scale of the damage suffered, we note that while maintaining this level of losses (which, of course, the French fighter aircraft, which was melting before our eyes, could not provide), the Luftwaffe bombers should have completely “ended” by the end of May! For the

sake of truth, it must be admitted that on May 10, the French pilots did not fight alone, they still had allies. First of all, the Dutch fighter aircraft. I'm not kidding. It was the tiny aviation of a small but proud and freedom-loving country that turned May 10 into a “black day” for the Luftwaffe, the day when it suffered the biggest losses in the entire period of World War II.

Holland is a country of canals and dams. A significant part of the country's territory (which is reflected in its name) is below sea level and can be flooded for defensive purposes. Translated into military language - "tank inaccessible terrain." Therefore, the "blitzkrieg" in the Netherlands was to take place in the form of a large-scale airborne operation. The 22nd Infantry Division, under the command of

General Sponeck, trained and equipped as an airborne division, was to land between Leiden and Rotterdam, and the paratroopers of General Student's 7th Airborne Division were to capture the railway and highway bridge over the Meuse River.

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Accordingly, hundreds of heavy transport three-engine Ju-52s were involved in the landing of parachute and landing assault forces.

The basis of the Dutch fighter aviation was 60 Fokker-D.XXI fighters (of which only 28 machines were in good condition on May 10). In appearance and in terms of flight and tactical characteristics, the Fokker was an analogue of the early modifications of our I-16 (namely, the early ones, it “did not reach” the models of 39-40 in all respects). These planes staged a real beating of German transport workers on May 10th. At dawn, at 6:45 a.m., a group of Dutch fighters intercepted the first echelon of the landing force, consisting of 55 Ju-52 aircraft. Although the Dutch pilots themselves reported that they shot down 37 aircraft, in reality, as follows from the documents of the Luftwaffe, the German losses amounted to 39 aircraft.

At seven o'clock in the morning the day was not yet over, and the extermination of the Junkers continued. In addition to fifty fighters, the Dutch air defense also had 16 anti-aircraft batteries, three guns each. At the Walhaven airfield near Rotterdam, anti-aircraft guns fired until they were captured by German paratroopers. Dutch pilots broke through under the deadly "umbrella" of patrolling German fighters and stormed crowds of people and aircraft on captured airfields and sandy beaches of the sea coast. In the afternoon, Walhaven airfield was hit by several RAF Blenheim bombings. This was, in fact, the first day of the "triumphal march." 157 transport "Junkers" was completely

destroyed. K. Tippelskirch, in his well-known monograph, was forced to admit that ***"the landing of airborne assault forces from the 22nd Infantry Division in the area between Rotterdam and Leiden was not successful everywhere, and in some places even failed completely and fell to heavy losses ..." .*** (96) The history of the struggle of Dutch aviation lasted exactly 5 days. By noon on May 14, the number of combat-ready aircraft was reduced to zero. The Dutch Air Force died in battle, inflicting huge losses on the enemy. The Luftwaffe lost over the Netherlands at least 189 aircraft of all types! There are other estimates - according to R. Jackson, the Dutch Air Force and Air Defense destroyed 315 German aircraft.

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English pilots fought just as selflessly in the skies of France. Already at noon on May 10, the commander of the Royal Air Force grouping in France ordered the Battle light bomber squadrons to be raised to attack Wehrmacht motorized columns. Operating from extremely low altitudes, the British lost 13 aircraft out of 32 that flew that day from anti-aircraft fire and German fighters. The next day, out of eight Battles, only one returned to base. On May 14, 1940, a fierce air battle broke out over pontoon crossings across the Meuse in the Sedan area. Just as the Soviet command on June 30, 1941 threw all available aviation forces with the task of "at any cost" to stop the crossing of German tank units across the Berezina, the Allied command tried that day to stop the enemy's rapid advance at a large water line. 71 Battles took part in the raid, 31 aircraft returned - there would be no operation with a higher percentage of losses in the Royal Air Force for the entire long war ... English fighters also suffered heavy losses. By the beginning of the Nazi invasion, the Royal Air Force relocated 4 Hurricanes squadrons and two squadrons

armed with the Gladiator (an outdated biplane fighter, inferior in all respects to the Soviet I-153 "Seagull") across the English Channel. Already after May 10, four more Hurricanes squadrons were urgently transferred to France, so the Allies had 10 squadrons in total (about 120 aircraft in the “first line”). By nightfall on May 15, that is, in six days of fierce fighting, the British Air Force in France had lost 71 Hurricanes and about 15 Gladiators. On May 19, due to the rapid advance of the German troops and the threat of capturing home airfields, the British command ordered the redeployment of the surviving aircraft and pilots of seven squadrons to bases in southern England. Three squadrons remained in France until the tragic denouement. In the chaos of the retreat, a thorough record of victories was not possible, nevertheless, British pilots can claim 100-120 enemy aircraft shot down in the skies of France (see below). With the withdrawal of British squadrons from French territory, their participation in the air war did not stop at all. finest hour

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The RAF arrived in the "days of Dunkirk". At the end of May 1940, German tank divisions, moving to the northwest, broke through the Allied defenses, reached the English Channel and surrounded the remnants of the British Expeditionary Force and French troops near the sea coast in the Boulogne-Dunkirk region. In the situation that had arisen, Churchill saw no other way out than to turn to the British people with a request to use any floating object to save those surrounded. Further events in the description of the former Nazi general went like this: ***“A strange fleet moved to the coast of Flanders, the like of which history has not yet known ... motor boats, longboats, sailing ships, rescue boats, passenger steamers from the Thames, lighters and yachts, resembling a huge swarm of wasps, kept close to the coast all the time. The smallest vessels approached the shore, loaded people and delivered them to numerous warships, ranging from torpedo boats to destroyers, on which they got to the saving coast of England ... The British troops maintained exceptional discipline. The rescue ship teams fearlessly continued to evacuate troops even during the most intense air raids ... "***

In total, 861 ships of various types took part in the rescue operation, on which 338 thousand people were transported across the English Channel! Of course, this became possible only thanks to the successful actions of the British fighter aircraft, which covered the area where the troops were loaded. During the eight days of Dunkirk (from May 27 to June 4), 16 squadrons of British Spitfires and Hurricanes carried out almost 2,000 sorties and shot down (the figure is confirmed by Luftwaffe documents) 132 German aircraft. W. Churchill gave a balanced and accurate assessment of what happened. Speaking in the House of Commons on July 4, 1940, he said: ***“The war is not won by evacuation. But in the course of this evacuation, a victory was won that should be noted. It has been achieved by the Air Force. This was a great test of the strength of the British and German Air Forces ... ”*** No matter how significant and

selfless the help of the allies was, the main burden of the beys fell on the lot of French aviation. In total, from May 10 to June 24, French fighters

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completed 9987 sorties and reliably shot down 684 German aircraft. The number of French aviation was rapidly declining (by June 11, about 170-200 aircraft remained at the front), but bloody battles continued until the day the armistice agreement was signed. Evidence of this is, in particular, the dates of the loss of command personnel. So, on June 10, the commander of the Polish air group GC I / 145, Major Kepinski, was seriously wounded; on June 13, the commander of the air group GC III / 2 Zhey was shot down; in an air battle, the commander of one of the best fighter air groups GC I / 5 Akkar was wounded. In total, 257 French fighter pilots were killed in air battles, 218 were wounded. The losses of military equipment amounted to 250

aircraft shot down in air battles, 123 crashed in accidents and catastrophes, and an incalculable number of aircraft destroyed at airfields both by German air strikes and by the French themselves due to the impossibility of their evacuation in the situation of chaos that gripped the country. Summing up the final results of the air war, we can state the main fact: being in the numerical minority and piloting aircraft inferior in terms of performance characteristics to Luftwaffe fighters, French fighter pilots shot down twice as many enemy aircraft as they lost in air battles

themselves.

Table 12 shows the structure of the cumulative irretrievable losses of Luftwaffe aircraft during the French campaign. The category "other" is an arithmetic value obtained as the difference between the sum of all deadweight losses and its individual components. In fact, the "others" are mainly the result of the fighting in France by British fighters, as well as aircraft shot down by French anti-aircraft gunners and bomber gunners.

Table 12

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	Безвозвратные потери Люфтваффе
Французские истребители	684
Голландская ПВО и истребители	189
Английские истребители над Дюнкерком	132
Аварии и катастрофы	272
Прочие	124
Итого:	1 401

Even the Nazis could not fail to recognize the stamina, courage and combat skill of their opponents. The preamble to the terms of the Armistice Agreement (which Soviet historiography, contrary to logic and facts, called “surrender” with maniacal persistence) said: ***“...France was defeated and defeated after heroic resistance during a series of bloody battles. Therefore, Germany does not intend to give the terms of the armistice or the negotiations about it an insulting character for such a brave adversary ... ” (96)*** The German generals spoke in such a language not at all by chance. The armed forces of Germany - primarily German aviation - suffered huge losses, and another one and a half to two months of such a "triumphant march" could lead the aggressor straight to complete collapse. The total irretrievable losses of the Luftwaffe (including transport aviation) amounted to 1401 aircraft of all types, including: 477 bombers, 371 fighters of all types, 123 dive "Ju-87", 211 reconnaissance aircraft. These are irretrievable

losses. In the course of intense hostilities, total losses (killed plus damaged) are no less important, since they determine the balance of forces with which aviation can continue to fight. The total losses of the Luftwaffe amounted to 2073 vehicles, including 1402 percussion

aircraft:

- 691 bombers (40% of the original number); - 376 single-engine fighters (31%); - 171 Me-110 twin-engine fighters (54%);
- 164 Ju-87 dive bombers (46%).

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Thus, in just a month and a half, 38.5% of the initial strength of strike aircraft of the 2nd and 3rd Air Fleets was lost (see Table 9). The adventuristic plans of

the fascist leadership did not provide for such losses, and the German military industry, despite its enormous potential, was not ready to make up for them. So, for example, only 180 Messerschmitt Bf-109s were produced in June 1940 (an average of 6 aircraft per day). As a result, the number of single-engine fighters in the Luftwaffe as a whole was reduced from 1,329 aircraft on 10 May to 1,107 aircraft on 29 June.

Much water has flowed under the bridge since then, but none of the French politicians, historians, writers has yet thought of calling the events of May-June 1940 "the great patriotic war of the French people." Or at least an example of a successful defensive operation. On the contrary, the words "May 1940" became for France a synonym for catastrophe and the greatest national disgrace. And the losses that the French, British, Dutch pilots were then able to inflict on the enemy, this is the minimum minimum that only turned out to be achievable in the conditions of general collapse, chaos and paralysis of the will of the country's top leadership. Brand new fighters from the factory were driven straight to Algeria, while the head of the government Reynaud sent the following telegrams to Churchill on the sixth day of the war: ***“Last night we lost the battle. The road to Paris is open. Send all the planes and troops you can send."*** Paris was not occupied by the Germans back in May only because the avalanche of Wehrmacht tank divisions, after crossing the Meuse, rolled not to the south-west, to the center of the country, but to the north, to the English Channel. The capitulators and traitors "catch up" the following month. On June 10, the government secretly fled from Paris to Bordeaux. On June 14, Paris was surrendered to the German troops without a fight ... In a word, Comrade Molotov was

absolutely right. Talking on June 13, 1940 with the ambassador of fascist Italy A. Rosso, the head of the Soviet Government (according to the rules of Soviet grammar, this word was written that way, with a capital letter) Molotov said:

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"after the serious blows received by England and France, not only their strength, but also their prestige has fallen and the dominance of these countries is coming to an end. It must be assumed that the voices of Germany and Italy, as well as the Soviet Union, will be more audible than even a year ago ... England and France, as events show, with their old political foundations do not stand the test. Other countries turned out to be more adapted to the new conditions than they are. Italy gave a lot of new things, Germany gave a lot of new things. The USSR also gave a lot of new things, following its

Yes, the fighting brotherhood of the fascists and communists grew stronger day by day. On July 24, this time from Rome to Moscow, a dispatch arrived. The ambassador of Bolshevik Russia enthusiastically reported on his meeting with the leader of fascist Italy: ***"... Mussolini met me at the door of his huge office. During the conversation, he was kind and at the end of the audience he escorted me to the door of the office ... Mussolini emphasized that at the moment three countries - the USSR, Italy and Germany -*** despite ***the difference in internal regimes*** (and this is the absolute truth - did not have their own Kolyma ... - ***M.S.), there is one common task: it is the struggle against the plutocracy, against the exploiters and warmongers in the***

West. (69, pp. 453, 454) In the summer of 1940, it seemed red-brown (and not without reason!) that their "struggle against the plutocracy and Western warmongers" was close to a triumphant conclusion. It only remained to put an end to England, locked on its island. Churchill's stubborn unwillingness to surrender to the mercy of the victors made Hitler laugh so much that in one of his public speeches he compared the British Prime Minister to a rooster, whose head had already been cut off, and which was still running around the yard on weakening legs

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Chapter 12

MINIMUM AND MAXIMUM

The air battle of May-June 1940 over France can serve as a practical example of what minimal losses the Luftwaffe could suffer in a collision with fighter aircraft, inferior to it both in numbers and in the performance characteristics of aircraft. Minimal - because, let's repeat this once again, courageous French pilots fought in the sky over the collapsing state. "Great rot" started up in the French state, and even the suicidal heroism of the few soldiers who remained faithful to the oath could not save her from a shameful defeat.

The air battle of August-September 1940, which went down in history under the name "Battle of Britain", can serve as a practical example of what maximum losses the Luftwaffe could suffer in a collision with fighter aircraft, significantly inferior to the Germans in numbers and partially in the performance characteristics of aircraft. Maximum - because the courageous English pilots fought in the sky over the state, the people and government of which were united in their firm determination to fight for the freedom of their country to the last bullet and the last soldier. Even Comrade Maisky himself, the most shameless of Stalin's toadies, that same Maisky, the author of Who Helped Hitler? (in which he, like twice two, proved that Hitler was not helped by the Soviet Union, which urgently glorified ***"gasoline and gas oil for the German army, whose actions are remarkably successful",*** but precisely the country in which Maisky served as ambassador), even he on June 22 (strange sometimes History lets go of jokes ..) 1940, on the eve of the German air offensive, reported from London to Moscow: ***“Now it can be said with complete certainty that the decision of the British government, despite the surrender of France, to continue the war finds the universal support of the population ... A large role in this was played by Churchill's speeches. There is no panic. On the contrary, a wave of stubborn, cold British fury and determination to resist to the end is rising.***

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Further, the Soviet ambassador in England, with some confusion and fear (of course, because he could not put into practice the previous decisions of the Executive Committee of the Comintern and another leading comrade) reported that "among some of the Communists, approximately the following concept is growing: the present war, contrary ***to will of its initiators, turns into a "defensive" and "just" war with all the ensuing consequences ... Everyone thinks of only one thing - how to beat off the upcoming German attack ... Churchill enjoys great prestige in working circles ... Lengthening working hours, abolishing the trade union (as*** in text. - ***M.S.), restrictions and other things in military production pass without great difficulties due to the indicated moods of the masses ... " (69,*** pp. 361, 362)

The "indicated moods of the masses" did not change after the start of the systematic bombing of London and the deaths of thousands, and then tens of thousands of civilians. On September 14, 1940, Maisky wrote to Moscow: ***"Today is the sixth day of a concentrated air attack on London... There is no doubt that the Germans are hitting not only and not even so much at military targets, but at the broad masses of the population. There is no other way to explain the fact that they widely scatter bombs over all parts of the city, and moreover, which is especially characteristic, small-caliber bombs, 10-15 kg, which are clearly not suitable for striking military targets. A large number of incendiary bombs were also dropped ... Houses destroyed at every step, pavements torn apart, windows broken ... There was no panic and no. The firm position taken by the British government played a significant role here. Of course, anxiety, anxiety, uncertainty about the future remained, but no defeatism is yet noticeable ... " (69,*** p. 602) Starting from

September 7, London was bombed for 65 days (but mainly way - nights) in a row.

On the night of November 15, 1940, during one massive air raid, 437 Luftwaffe bombers dropped 394 tons of high-explosive and 56 tons of incendiary bombs on the city of Coventry.

In general, until the end of January 1941, the loss of the civilian population amounted to 86 thousand people, more than 1 million residential buildings were destroyed - but defeatist moods did not appear.

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Queen Elizabeth (the mother of the current Queen Elizabeth) did not leave for Canada, or for Kuibyshev, or even for her native Scotland. She traveled through the destroyed London quarters, as the head of the Red Cross handed out blankets to the homeless, she was the first to arrive in Coventry, which was burned overnight. Despite the most acute "raw material shortage", the industry of England worked in three shifts, and the production of combat aircraft steadily increased. This

is how the country showed itself, the fate of which was in the hands of 1434 pilots. Yes, just such a personnel resource was available on the eve of the battle, the Royal Air Force Fighter Command. (46) Churchill wrote, ***"Never in the history of conflict have so many citizens owed so much to such a small handful of people."*** The history of the "Battle of Britain"

is described in hundreds of books, in great detail, literally by the day and even by the hour. We will not repeat ourselves and confine ourselves to summarizing extremely short
results.

On July 10, 1940, Fighter Command had 49 squadrons at its disposal, by September 15 this number had increased slightly to 52 squadrons. Most (33 squadrons) were armed with Hurricanes, and only 19 squadrons were armed with Spitfires. The British managed, despite average daily losses of 15–20 aircraft, to maintain at the initial stage of the battle the number of combat-ready fighters in the range from 704 (August 17) to 754 (August 31) aircraft.

Enemy (2nd, 3rd, 5th Luftwaffe Air Force)
had the following powers:

Table 13

	10 мая 1940 г. самолеты / группы	13 августа 1940 г. самолеты / группы
Бомбардировщики («He-111», «Do-17», «Ju-88»)	1736 / 40	1482 / 42
Пикировщики («Ju-87»)	360 / 9	365 / 9
Истребители («Bf-109»)	1 226 / 27	976 / 26
Многоцелевые истребители («Me-110»)	319 / 9	244 / 9
ИТОГО:	3 641 / 85	3067 / 86

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As can be seen from Table 13, the Luftwaffe was unable to make up for the losses incurred during the French campaign. The number of combat-ready aircraft was even smaller. According to various sources, it was in mid-August: 1040–1145 bombers, 787–821 fighters, 189 Me-110s, 286–294 dive bombers. But in any case, the superiority of the Luftwaffe in the total number of combat-ready aircraft was at least threefold.

The task assigned to the Luftwaffe was to destroy the main forces of enemy fighter aircraft within 8 days by strikes on airfields in southern England and air battles, to gain strong air supremacy over the English Channel and thereby create the necessary conditions for the landing of Wehrmacht ground forces on the British islands.

This task was never completed. The fiercest fighting took place between 25 August and 7 September. During these two weeks, the British lost 285 aircraft (a third of all combat-ready machines), 103 pilots were killed and 128 were seriously wounded. Nevertheless, the losses of the Luftwaffe were even greater: the Germans lost 385 aircraft, including 240 fighters. By October 6, irretrievable losses of the Luftwaffe

amounted to:

— bombers of all types: 685 aircraft, including 543 shot down in combat; - fighters of

all types: 753 aircraft, including 675 shot down in air battles. Already from mid-September

1940, the German command was forced to abandon massive daytime raids and switch to terrorist night bombing of British cities. This made it possible to withdraw the remnants of the fighter groups from the battle and drastically reduce the losses of bombers (for three months - October, November, December - "only" 283 bombers were lost). But these massacres of civilians no longer had any operational, much less strategic meaning. The landing on the British Isles had to be postponed for an “indefinite period”, the Royal Air Force not only was not defeated, but also continuously grew quantitatively and qualitatively (re-equipment of fighter squadrons with

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obsolete "Hurricane" on the "Spitfire"). By the end of 1940, the number of irretrievable losses of the Luftwaffe reached (according to various sources) 1733-1813 aircraft. The British lost a little more than nine hundred (902-915) fighter aircraft during the same time. The final ratio of aircraft losses was 1 to 2. And this is with the initial ratio of the number of combat-ready aircraft of 3 to 1 in favor of the Luftwaffe. Such a victory could not have been achieved with little bloodshed. Suffice it to note only the fact that out of 52 squadron commanders, 14 were killed, and another 10 were seriously injured. In the 43rd squadron, four commanders changed in three months of battle! One of the most productive squadrons of the Royal Air Force (the 501st, flying the Hurricanes, destroyed 43 German aircraft) changed its flight crew twice in 35 days of fighting. (45, pp. 82, 84)

Finishing the story about the events of the "Battle of Britain", it is worth specifically asking the reader "not to look for a black cat in a dark room." Precisely because it is not there and never was. No "national overtones". The subjects of the English queen were people of various languages, faiths and races. In the summer of 1940, a genuine "anti-fascist international" was fighting in the skies of the British Empire. Among the pilots of the Royal Air Force were Poles, Czechs, French, New Zealanders, Canadians, South Africans, Australians ... The fourth most successful squadron of the Fighter Command is the “Polish” 303rd (for 6 weeks, flying on the Hurricanes, the squadron shot down 44 enemy aircraft): The fourth most successful ace of the "Battle of Britain" is the Czech Josef Frantisek (17 victories). Among the "Poles" is found a pilot named Shaposhnikov (8 victories). Stanislav Skalsky was born in Russia, shot down the first German plane in the sky of Poland on the first day of the war - September 1, 1939, fought in the Royal Air Force until the end of the war (21 victories). Another "Pole" is a prince by the name of Golitsyn. Prince Golitsyn became famous for contriving to bring down the Messerschmitt at an altitude of more than 10 km - it is technically impossible to do this on the Hurricane, but, as the French say, noblesse oblige (noble ***birth*** obliges ...).

The success achieved by the Royal Air Force is so bright and convincing that it is difficult to reconcile this success with the understanding that

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The main fighter aircraft of the “Battle of Britain” in terms of its performance characteristics was inferior not only to the newest “Messerschmitt” of the E series, but also to

the “hopelessly outdated” I-16. To reiterate, out of the 52 squadrons of Fighter Command, only 19 (36.5%) were armed with Spitfires, and two-thirds of the fighter squadrons fought the entire battle in Hurricanes. The design of the English "hurricane" began in 1933, the first flight took place on November 6, 1935. In a word, this is an aircraft of the same generation of the first "high-speed" (by the standards of the mid-30s) monoplane fighters with a specific load of just over 100 kg / sq.m., as our I-16. The idea was the same, but it turned out differently. The designers of the oldest aircraft manufacturing company Hawker turned out to be a bulky structure (sheathed, by the way, not even with plywood, but with canvas) with a wing area of 24 square meters. m and an empty weight of 2118 kg. Polikarpov's fighter, with the same engine power and equivalent armament, had a wing area of 14.5 square meters. m and an empty weight of no more than 1433 kg, even in the heaviest (i.e., cannon) modifications. What follows can no longer be explained.

Table 14

	Вес, взл., кг	G/S, г/кв. м	P/G л.с./т	Скорость, max. км/час	Скорость у земли, км/час	Скорость верт. у земли, м/мин
«И-16», тип 24	1 780	122,4	523	489 / 4,8 км	440	938
«Харрикейн» Mk-I	2 990	124,6	334	510 / 5,2 км	412	700
«Спитфайр» Mk-1	2 812	125,5	356	582 / 5,5 км	460	770
«Bf-109E-3»	2 600	159,0	365	570 / 4,5 км	440	769

The best ace of Germany at that time, V. Melders, having flown around the Hurricane captured in France in the summer of 1940, left the following review about him: “The ***Hurricane is a flying barge with a retractable landing gear. Although it flies well, it is stable on a turn, but in terms of its combat characteristics it is hopelessly inferior to our Bf-109: the rudder moves hard, the aircraft sluggishly obeys the***

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(low angular rate of roll, respectively - slow entry into the turn). Soviet aircraft designer A.S. Yakovlev writes in his memoirs: ***“The British were inclined to supply us with completely obsolete Hurricane fighters, the use of which they themselves had already refused at that time. These Hurricanes could not fight the Messerschmitts in any way.*** (86) Negotiations for deliveries took place at the end of September 1941. Despite the colossal losses of the first months of the war, the Soviet government refused such a "gift" as the English Hurricane. The firmness of Yakovlev’s position is especially impressive: “they couldn’t fight the Messerschmitts in any way ...” The fact that the Hurricane was inferior to the Messerschmitt in terms of the entire set of performance characteristics was never disputed by anyone. That the I-16 was superior to the Hurricane in all flight characteristics (with the exception of a very slight superiority in speed at high altitude) is also beyond doubt. In this regard, it is interesting to hear the opinion of the pilot who fought against the "Messers" both on the "donkey" and on the "Hurricane".

- Nikolai Gerasimovich, as it seemed to you "Hurricane" at first glance?

The first impression is "humpbacked"! Such a “humpback” cannot be a good fighter! Subsequently, the impression has not changed. The planes were especially struck. Thick.

The Hurricane had thicker planes than the Pe-2. ***- Was the Hurricane easier to manage than the I-16?***

Yes, it's easier. Difficulties in learning and piloting did not deliver. ***- Did the wing arrangement of the weapon interfere?***

How disturbing! There ***(i.e., on the Hurricane.*** - M.S.) two and a half meters between the nearest trunks. It took a lot of bullets to disperse, and the "dead zone" was large. ***- Marshal Zimin, he was one of the first to start mastering the Hurricanes, so he wrote in his memoirs that “fighting on the Hurricane is like fighting***

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riding a pterodactyl. A unique, he said, aircraft in aerodynamic terms: it does not pick up speed during a dive, it immediately loses speed during a pitch-up ...

Everything is correct. Definitely a pterodactyl. He had a thick profile. The acceleration dynamics is very poor ***(the power-to-weight ratio is one and a half times less than that of the I-16*** - M.S.). In terms of maximum speed, it was perhaps faster than the I-16 (lower resistance of the “sharp-nosed” liquid-cooled motor. - M.S.), but until it picks up this speed, a lot of things can happen. He was not late for the rudders, but everything worked out somehow smoothly, slowly. "I-16" - as soon as he put down the rudders, he immediately turned over, with a jerk, and this "humped" one was very slow. The Hurricane burned quickly and well, like a match. Percale. ***- And "I-16" burned worse? It's also percale.*** Worse.

The engine of the "I-16" was much more reliable

(probably, the advantage of the air-cooled engine in terms of combat survivability is meant. - M.S). Yes, and a small "I-16", it still

need to get in.

- Nikolai Gerasimovich, if you had a choice, which fighter would you prefer to fight on, the I-16 or the Hurricane? Of course, on the

"I-16", on the one that fought - the 28th type. But there was no choice...

These are excerpts from an interview with former fighter pilot N.G. Golodnikov. Nikolai Gerasimovich fought in the famous 2nd Guards IAP of the Air Force of the Northern Fleet, commanded by the best ace of the Arctic, twice Hero of the Soviet Union B.F. Safonov. After the war, N.G. Golodovnikov rose to the rank of major general of aviation and the post of chief of air-gunnery training of the Air Force of the Northern Fleet. In the air war in the North, our opponents

were not only the German, but also the Finnish Air Force. Finnish pilots fought on fighters assembled from all over the world, as a rule, not the best

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quality and not the first freshness. They had French Morans, and Italian Fiats, and Dutch Fokkers, and American Brewsters ... But even pilots who were accustomed to flying on such outdated equipment did not consider the Hurricane a worthy competitor.

> “Of all enemy fighters, the Hurricane is the easiest to shoot down. It is completely helpless against us at altitudes up to 3 km. He is slow, clumsy and unmaneuverable. When you encounter the Hurricane, draw it into the fight on the curves, where it will be completely at your mercy. To destroy this aircraft, it is best to shoot at the front of the fuselage, and it will instantly be engulfed in flames.

(97)

The above quote is taken from recommendations on air combat tactics, which were compiled no earlier than April 1943 by the Finnish fighter pilot H. Wind (Finland's second highest scoring ace, 75 claimed victories; his lecture notes were used as educational material in the Finnish Air Force for several decades) . The developers of British fighters were rather frivolous in

providing passive protection and survivability. If the Soviet I-16s of all types, starting from 1936–1937, were standardly equipped with a pilot’s armored back, then both the Hurricane and the Spitfire (and, by the way, the Messerschmitt) were put into production without any armor protection. The Germans began to install the armored back only after the French campaign, starting with the E-3 modification. On the Spitfire, the armored back of the pilot appeared only starting from the Mk-II series, that is, minimally protected aircraft appeared in units no earlier than the autumn of 1940, at the end of the “Battle of Britain”.

The protection of the gas tank on the "Messer" of the E series was also very conditional. The specialists of the Air Force Research Institute wrote in their report: ***"the protector is very thin and obviously serves to protect against accidental leakage."*** Duralumin gas tank "Messer" repeated the shape

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seat and was behind and under the pilot's seat. It is unlikely that this 400-liter “canister” with gasoline, moreover, located in the zone most likely to be hit by fire from an enemy attacking from behind, cheered up the Luftwaffe pilots ... Perhaps it was precisely the poor protection of the Messerschmitt gas tanks that became one of the reasons that the British fighters, armed only with rifle-caliber machine guns, they successfully destroyed them in air combat. The undoubted advantages of the Messer

(moreover, the advantages not visible in any table) include the fact that, starting from the E series, the engine of the German fighter was equipped with a direct fuel injection device (today this is called “injector” by motorists). In addition to all the other advantages of the injection power system (greater efficiency, reliability), throttle response without a carburetor, the aircraft engine (and, therefore, without a float chamber) forces. could work stably in inverted flight and at negative g-

In the summer of 1940, not a single English, Soviet, French fighter had such capabilities. To quickly go into a dive, they had to first perform a “half roll” and only then start diving, thus constantly maintaining positive overload values, while the Messer pilot just had to push the handle forward, and his plane rushed down in a convex arc. As has been repeatedly noted, the Messer “rushed” down exceptionally well, overtaking any modern fighter in a dive. True, serious problems arose with the exit from a high-speed dive.

So, the British pilots, who tested the captured Messerschmitt in the summer of 1940, wrote in their report: ***“Manipulation of the rudders and ailerons at speeds from 483 to 644 km / h is difficult and quickly becomes tiring, the pilot is forced to exert considerable effort even for minimal aileron deflection, the horizontal rudder becomes so heavy that the pilot can make only small deviations from the neutral ... " (77)***

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It is noteworthy that the British and Soviet testers, quite independently of each other, write the same thing - the German fighter shows sufficient maneuverability and controllability only at speeds up to 300-350 km / h. The optimal speed for performing a steady turn (according to the results of tests at the Air Force Research Institute) was a speed of 248 km / h. A combat turn (with a very modest climb of 500 m, which is much worse than that of our “lacquered coffin” LaGG-3) was recommended to start at a speed of 355 km / h. For Soviet fighters of the “new generation” (Yak-1, MiG-3, LaGG-3), these recommended combat maneuvering speeds were on average 100 km / h more. Tests of the Messerschmitt 109E-3 at the Air Force Research

Institute showed that it showed high efficiency of the ailerons only at speeds up to 280–300 km / h (the roll time at this speed was 5 seconds). Further, the effectiveness of the ailerons fell, and at a speed of more than 550 km / h, the roll angular velocity decreased to a completely unacceptable value of 11 deg / s. (i.e., just to start an energetic turn, the “Messer” needed 5-7 seconds!) We emphasize again: problems with controllability at high speeds (especially with loss of

aileron efficiency) were common to all fighters of that time . Everyone, but to varying degrees. It was no coincidence that the Messerschmitt differed from other aircraft in a particularly strong deterioration in handling parameters. This fighter was designed in 1935 to fly at a maximum speed of 465 km/h. With the expectation of such a speed, aerodynamic rudders and their control system were designed. Simply put, at high speeds, the Messerschmitt turned from a moderately maneuverable fighter into a kind of unguided artillery shell. According to the most important criterion - the effectiveness of onboard weapons - cannon modifications of the "donkey" clearly surpassed the "Messerschmitt" (we wrote about this in

detail in Chapter 10). The advantage of the I-16 over the Messer in horizontal maneuverability also does not raise any doubts (the specific load on the wing is lower, the power-to-weight ratio is one and a half times higher, as a result, the time to complete a steady turn is 17-18 seconds.

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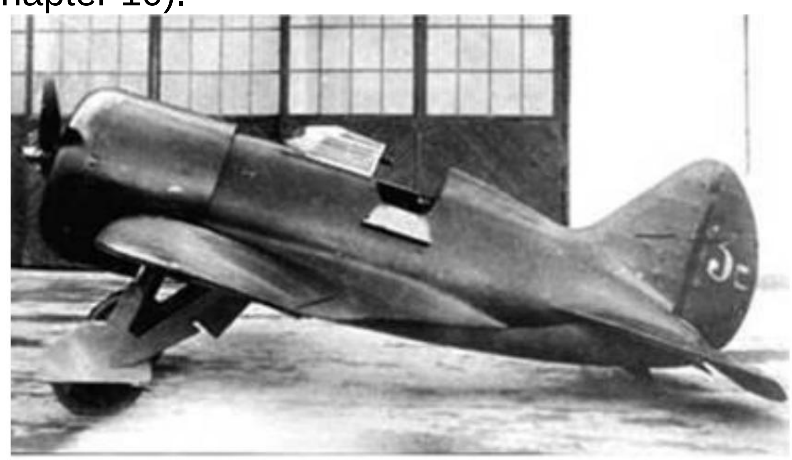
against 27 sec. at "Messer"). The combat survivability of a fighter with an air-cooled engine is always higher. Gas tank "donkey" models 1939-1940 was effectively protected, made of fiber (a kind of thick cardboard), which does not give - unlike the dural "Messer" tank - notches that prevent the protector from tightening zero holes. In addition, on all types of I-16, the gas tank was located between the pilot and the engine, that is, in the most protected area - in front of the engine and behind the armored back - zone.

The mythical "advantage" of the German fighter in rate of climb (this thesis has become just a common place in most domestic publications) is not confirmed by anything: not by tabular data (the vertical speed near the ground for the "I-16" type 24, 28, 29 is higher than for " Messer"), neither sound logic (the power-to-weight ratio of the I-16 is a record high and about 10% higher than that of the enemy), nor the quality assessments of test pilots. ***“The rate of climb is poor, it is somewhat sluggish in performing aerobatics”*** - this is how the “Messerschmitt” “Bf-09E-3” was rated in the report of the Air Force Research Institute. As for the most important thing for the battle, i.e., dynamic, rate of climb, then in this aspect the “thin” was, of course, better, but here a lot depends on the situation (who is higher), and on the experience and skill of the pilot (this This issue has been discussed in detail in Chapter 10).



"I-16"

The real and inalienable advantage of the "Messerschmitt" over the "I-16" was only speed (80 km / h higher in flight at high altitude). Further - more, that is, worse for us. In the summer of 1941, more than half of the Luftwaffe fighter groups

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on the Eastern Front, they were re-equipped with the next, faster modification - the Messerschmitt Bf-109 F-2. This "Messer" was no longer inferior to the "donkey" in static rate of climb and significantly surpassed it in horizontal speed throughout the entire altitude range (by 90-120 km / h). In combination with a record high dive speed, this allowed the Messer to leave the battle with the I-16 at any time without hindrance. Which, of course, is an important advantage. It is far from always necessary, as they say, to "climb ahead." Another thing is also unconditional - it is impossible to gain an advantage in the air by constantly "leaving the battle" and "freely breaking away from the enemy". The Messer could not conduct a maneuverable battle at high speeds due to the loss of controllability, and at speeds of less than 400 km / h, all the advantages in flight parameters and armament passed to the I-16.

At this point, we will finish our “theoretical” reasoning and study what highly experienced practitioners have written about this.

> The I-16 aircraft, of course, is inferior to the Me-109 in speed, but in terms of maneuver it is better than the Me-109. I-16 cannot impose a fight on a "Messer" who does not want to fight, but with an enemy going to fight. "I-16" is able to deal perfectly. "I-16" from the attack "Me-109" can always dodge, if only the pilot "I-16" noticed the enemy in time. Usually the battle on the "I-16" is carried out on frontal attacks. For the I-16, as well as for all types of fighters, the height advantage is of great importance. When attacking the "Me-109" from the front hemisphere from above, the pilot of the latter is not protected by anything. The I-16 at the top can attack the Me-109 from behind by reducing ***(i.e., dynamically converting altitude into speed.*** - M.S.), so for the I-16 group it is absolutely necessary to have an excess and separation in height so that at least one pair is on top ...

This is another excerpt from the 1943 Air Combat Manual quoted above many times. It is worth noting,

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that by this year there were practically no “donkeys” left at the front, so the authors of the “Manual” (a top-secret document, not intended for the purposes of patriotic propaganda) actually summed up the combat use of Soviet “old types” fighters against “Messers”.

In the memoirs of Air Chief Marshal A.A. Novikov (in 1942 he already held the post of commander of the Red Army Air Force), we find even more significant confirmation that the "donkeys" and "seagulls" seemed to many pilots to be quite combat-ready fighters even in 1942. Novikov recalls that on September 28, 1942 (i.e., in the midst of the Battle of Stalingrad), he was summoned to Stalin to discuss the issue of resuming the production of I-16 and I-153. It is important to note that S .A. Khudyakov (at that time - commander of the 1st Air Army). At the beginning of the war, Khudyakov was chief of staff of the Air Force of the Western Front, that very Western Front, whose aviation suffered heavy losses in the first days of the war. As is commonly believed - due to the "hopeless obsolescence" of Soviet fighters. Better than anyone else, S.A. Khudyakov knew all the real shortcomings of the I-16, and yet it was he who considered it necessary to resume their production - even a year after the tragedy of the summer of 1941!

Of course, in September 1942, a desperate idea to return to the low-speed maneuverable fighters of the 1930s era was rejected. Their time is gone, and fighter aviation needed high-speed vehicles with powerful weapons, new equipment, and new capabilities for implementing vertical dynamic maneuver. Such aircraft, the testing of which began in the USSR even before the first serial Messerschmitt Bf-109E-3 was rolled out to the factory airfield ...

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Chapter 13 The Rat King and the "King of Exterminators"

Yes, indeed, in the winter of 1938-1939, tests of the I-180 fighter began, according to all performance characteristics, including the maximum speed over the entire altitude range, which surpassed the Messerschmitt of the E series. And already in the fall of 1939, drawings appeared on the drawing boards in the Polikarpov Design Bureau "I-185" - an aircraft that was far ahead of its time. Only at the end of the World War, in 1944-1945, serial fighters with I-185 parameters appeared in the skies of the war.

And with all this, on June 22, 1941, the fighter aviation of the western border districts was armed by three-quarters with "donkeys" and "gulls" - aircraft of the 30s. Yes, at the time of their birth, these

aircraft were so good, they were so ahead of the "level of the best world standards" that even in 1941 it was still possible to fight on them somehow. But is it really for this that a huge country, rich in natural resources and talented people, lived in barracks and communal apartments, worked in three shifts, in order to approach the moment of the fatal test with combat aircraft on which it was possible to “somehow fight”? One of the main participants in those events

described the reasons for the mysterious - at first glance - stagnation in the development of aviation technology in the USSR, moreover, the stagnation that began just before the war itself, as follows:

> ... In Spain, "I-15" and "I-16" first met with the "Messerschmitts". These were ME-109B fighters with a Junkers YuMO-210 engine with a capacity of 610 horsepower, and their speed did not exceed 470 kilometers per hour. Our fighters were not inferior in speed to the Messerschmitts, the weapons of both were approximately equivalent - machine guns of 7.6 mm caliber, our maneuverability was better, and the Messers got a lot from them ... This circumstance led the leaders of our

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aviation was very happy. An atmosphere of complacency was created, **the domestic fighter aviation with modernization was in no hurry.** ***(Highlighted by the author.)*** However, a sobering up came very quickly ...

The Nazis showed feverish haste and took into account the experience of the first air battles in the sky of Spain. They radically improved their machines ... In this form, the Messerschmitt fighter entered mass production under the brand name "ME-109E". When visiting the Messerschmitt factories in Augsburg and Regensburg as part of the Soviet economic delegation in the autumn of 1939, I saw how the mass production of the ME-109E was widely deployed. In 1939, about 500 of them were built. The modernized Messerschmitts were sent to Spain, where, under the command of the best German fighter pilot Melders, they took part in the air battles of the final stage of the Spanish tragedy. The advantage of these aircraft over the "I-15" and "I-16" was obvious ... In air battles, our fighters, despite their good maneuverability, turned out to be worse than the new German ones, inferior to them in speed and especially in the caliber of weapons and firing range ... And no matter how the heroism of the republican pilots was great, in the end the quality of the combat materiel decided the success ... After the fireworks of records, this was an unpleasant, at first glance even inexplicable surprise. But this was a real fact: we were

clearly lagging behind our potential adversary, Hitler's fascism, in the field of aviation ... Decisive, urgent measures were needed to overcome the lag ...

(86)

If my esteemed reader has ever read anything about the history of the development of domestic aviation, then he certainly remembers these - or very similar to these - reasoning.

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After the publication of the memoirs of the aircraft designer A.S. Yakovlev, this fragment was rewritten hundreds and thousands of times, from book to book, from article to article, with and without quotation marks, and thanks to repeated repetition, the false fable turned into an indisputable truth. Moreover, if numerous plagiarists were simply too lazy to think about what they are copying, then Comrade Yakovlev simply and frankly ... writes what is not true. In any case, it is hard to imagine that the man who officially held the post of Deputy People's Commissar of the aviation industry, and unofficially the position of Stalin's personal adviser on aviation, did not know the well-known facts. Only the first two

modifications (B and C) took part in the fighting in Spain. These planes, as Yakovlev himself absolutely correctly writes, did not have any advantage in performance characteristics over the Polikarpov I-16 fighters and were repeatedly and hard beaten. This situation continued until the last days of the "Spanish tragedy". Werner Melders arrived in Spain, in the German Condor Legion, at the

beginning of April 1938, and at that time only two of the four Condor fighter squadrons were armed with Messerschmitts of the B series - the other two fought on completely antediluvian biplanes "Not -51". Almost simultaneously with Melders, the first Bf-109Cs arrived in Spain, which were re-equipped only in the summer of 1938, the last summer of the war. Soviet pilots left Spain in the summer - autumn of 1938, Melders returned from the Spanish "business trip" to Berlin on December 5, 1938. (18, 63) Qualitatively new Messerschmitts of the E series were put into production only in January 1939, the first (and last) order for 40 Bf-09E-1 machines was shipped to Spain, already

under an agreement with the Franco government, in the spring of 1939. The "Spanish tragedy" - at least its armed phase - had already ended by that time. Thus, there was no technical superiority of German fighters in any of the episodes of the Spanish Civil War, and if ***"success was decided by the quality of the combat materiel",*** then the victory would have gone to the Republicans ... As for the Messerschmitt Bf-109E-3, received a cannon

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armament, its release began only in the autumn of 1939 - by this time the “Polish tragedy” had also ended. (18)

The main thing, of course, is not in these "mistakes" in the chronology. So purposefully Comrade Yakovlev made a mistake only so that against the background of the “technical backwardness” of Polikarpov’s fighters, which allegedly manifested itself in Spain, that ***“atmosphere of complacency” was outlined more clearly,*** in an atmosphere in which ***“there was no hurry with the modernization of domestic fighter aviation.”*** “Oh, Mozart, Mozart! When I’m not up to you…” This is when, in the history of the Stalinist empire, there was “no hurry” with the modernization of weapons?! When did such a year, or month, or day happen? As another great writer would say: "Lift up m

Firstly, in the Polikarpov Design Bureau, continuous work was carried out to modernize serial donkeys. In the same 1939, 314 I-16s type 17, 59 type 27 and 16 type 28 were produced, a total of 389 fighters with powerful cannon armament, which - let's change Yakovlev's words a little - "were better than the new German ones, especially in rate of fire and ***range gun firing."*** Secondly, work on fundamentally new, promising models did not stop for a day.

The first Polikarpov "sharp-nosed" fighter with a liquid-cooled engine and a cannon installed in the collapse of the cylinder block was designed and tested back in 1935! The aircraft was created on the basis of the French Hispano-Suiza Y-12 engine and was thus the "sibling" of the French Moran-Saulnier-406. That's just the "brothers" were born with very different weights: one weighed 1950 kg on takeoff, and the other - all 2470 kg. And the I-17 looked much more elegant, and its passive aerodynamic drag coefficient was 0.022 (a little more than the Spitfire, a little less than the Messerschmitt). Nevertheless, Polikarpov did not continue work on the I-17. Apparently, he understood the meaning and meaning of the "existence equation" better than his French colleagues. With a 750 hp engine it was impossible to make a full-fledged fighter aircraft, and the Soviet aircraft industry did not harass hundreds of tons of scarce aviation materials for the production of a stillborn aircraft.

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In the meantime, the "French imperialists", lulled by the 1935 mutual assistance treaty, sold Stalin another engine - a two-row air-cooled "star" Gnome Ron-14K. Plant No. 29 in Zaporizhia began production of new engines, which, of course, instead of the pretentious bourgeois name Mistral-Major, received the modest proletarian names M-85 - M-87 - M-88. In March 1938, the preliminary design of a new fighter under the M-88 engine was completed at the Polikarpov Design Bureau. Comparison of the parameters of the M-88 and M-63 (the American "Wright-Cyclone", which was put on "donkeys" type 24, 28, 29), at first glance, is puzzling - why was it "to change the awl for a sewing machine"? The maximum takeoff power for these engines is the same (1100 hp). The rated power at zero altitude for the "Frenchman" is even less (840 hp versus 930 hp for the M-63). At the same time, the M-88 was as much as 169 kg heavier!

All these shortcomings (or "features") were covered by the main one - the two-row "star" had a smaller diameter, respectively, and the area of \u200b\u200bthe "forehead" of the fuselage of the new I-180 fighter turned out to be 15% smaller. In addition, the M-88 was a much more “high-altitude” engine than the M-63 (power 1100 hp at an altitude of 4.5 km versus 900 hp for the M-63 at the same height). It is worth noting that the M-87/88 engines were installed both on the twin-engine "long-range" bomber "DB-3f" and on the short-range single-engine "Su-2". The launch of the main front-line fighter with the same engine into serial production created an optimal situation for maintenance and repair, especially in combat conditions. Finally, and most importantly, the engines of the Gnome-Ron series were still at the very beginning of their development, while everything possible was squeezed out of the American Cyclone (takeoff power increased from 625 hp in the M-25 up to 1100 hp for the M-63). In the Zaporozhye Design Bureau, work has already begun on the M-89 engine with a takeoff power of 1350 hp. In July 1941, the forced M-89 with a direct injection system showed 1560 hp in state tests. According to calculations, with such an engine, the maximum speed of the I-180 should have reached 650 km / h, i.e., surpass the speed of the fastest Messer Bf-109 F-4 at that time (or the fastest Yak- 3" born in 1944).

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In the summer of 1938, the production of the first copy of the I-180 fighter began at the Moscow plant number 156. According to the main layout solutions (in particular, the location of the gas tank in the fuselage, between the engine and the cockpit), the aircraft was close to the I-16, the tail section of the fuselage and the cockpit were simply identical. In this way, Polikarpov wanted to simplify both the development of the new fighter by combatant pilots, and the mass production of the I-180 at the Gorky plant No. 21, which at that time was producing the I-16. ***“In terms of maneuver, the aircraft is very close to the I-16. but it is more stable and better on turns and landing,*** - test pilot Ulyakhin wrote in the report. - ***At speeds less than 350 km / h and up to 160 km / h, the aircraft does not tend to stall into a tailspin, with adjusted trim tabs it maintains the set flight mode with dropped control ... "The changes affected mainly***

the shape and design of the wing, as well as the forward fuselage, which became much more "streamlined" in comparison with the blunt-nosed "donkey". The fighter was supposed to be armed with two UBS heavy machine guns and two ShKASs. All this battery was assembled (for ease of repair, maintenance and replacement) on a single carriage mounted above the engine in the forward fuselage. The choice of such a set of weapons can be considered a model of "reasonable sufficiency" for a light front-line fighter. Bullets "UBS" pierced armor and tore the protectors of any German fighters and bombers, in general, in terms of the size of a second salvo and the power of the weapon, the "I-180" was equal to the newest (although for 1939/1940 it would be more correct to say - "future") "Messerschmitt » Bf-109 E "I-180" on a ski chassis

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The closest constructive analogues of the I-180 were the French Bloch MB-152 and the American Hawk-75. This trinity is united by the fact that the Soviet and French aircraft were created on the basis of the same Mistral-Major engine, and the two-row Pratt-Whitney star mounted on the Hawk had the same weight and power. What happened as a result? (See table 15).

Table 15

	Вес, взл., кг	Вес пустого, кг	Мощность оружия, кВт	Скорость, max. км/час	Скорость у земли, км/час	Скорость верт. у земли, м/мин
«И-180»-3	2 429	1 815	670	575 / 7 км	455	990
«MB-152»	2 750	2 097	1 214	485		670
«Хоук-75» A2	2 600	2 121	390	489		930
«Bf-109E-3»	2 600	2 184	492	570 / 4,5 км	440	769

Note: the data of the heaviest variant "I-180-3" (1940) are given. As a result,

Polikarpov's fighter was again 250–300 kg lighter than that of the French and Americans. In all flight parameters - complete superiority. At the same time, his fighter with an air-cooled engine is not inferior in maximum speed over the entire range of altitudes to the sharp-nosed "Messer", for the high speed of which the low combat survivability of the liquid-cooled engine is "paid". And this is not the calculated data of the next "project". These are the characteristics of the machine, recorded in state tests, prepared for launch into mass production. What is this? The unique talent of the designer? Ability to assemble a team of worthy employees? Luck that

smiles on the most deserving? Already in 1935, after the international aviation exhibition in Milan, where I-15 and I-16 were shown to the astonished public, Polikarpov was given the unofficial title of "king of fighters". Although why exactly fighters? All his creations were marked with the seal of genius. training biplane

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"U-2" (later renamed "Po-2") was created in 1927 and was mass-produced until the end of the 50s! He worked in the sky as a training, communications, medical, agricultural aircraft. During the war years, it was surprisingly successful in the role of an ultralight night bomber. In terms of the duration of production and the versatility of the use of the U-2, it had no equal in the history of aviation. All Soviet pilots, every single one, who sat at the helm of an aircraft in the 30s-50s, underwent initial training on the U-2. The aircraft had unique flight parameters: it did not go into a spin even after the worst mistakes of the pilot, when it was forced into a spin, it got out of it on its own (with the control stick thrown), took off and landed on a forest clearing, and in case of engine failure in flight planned with a speed of descent of 1 -2 m/s, i.e. slower than a parachute! (20) And to top it all, it cost no more than an emka ...

The I-180 fighter was not inferior in terms of the entire set of performance characteristics, and in many ways it was superior to the Messerschmitt Bf-109EZ. Taking into account the similarity of the design of this aircraft with the I-16, as well as the production capacity of the Gorky Plant No. 21 (in 1940, 1607 combat I-16s of various types were actually produced and another 1103 15), one can make a well-founded assumption that if the I-180 was put into serial production, by June 22, 1941 it could completely replace the I-16 at the military airfields of the western districts (there were about 1650– 1750 "donkeys"). And this is without taking into account the fact that the Gorky plant was not alone in the country. So, for some reason, the largest Moscow plant No. 1 produced in 1939-1940. outdated I-153 biplanes in the amount of 3437 pieces ...

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"Seagull" I-153

Simultaneously with the testing and fine-tuning of the "I-180", Polikarpov's design bureau began designing a fundamentally new fighter "I-185". The fundamentally new aircraft in the photographs and pictures is almost indistinguishable from the I-180, and only if you look closely, you can see that the fuselage (especially its tail section) of the I-185 is somewhat longer than that of the I-180 (in fact, 6.88 m and 7.74 m). Two circumstances made this aircraft fundamentally new: a very high specific load on the wing and heavy-duty weapons. Polikarpov's fighters, created in the 30s, were distinguished

by a low specific wing load (65 kg / sq. M for the first series of the I-15 biplane and 100 kg / sq. M for the first types of I-16) and, as a result, exceptionally high horizontal maneuverability. So, the I-15 fighter performed a steady turn in 8 seconds! In the future, as the weight and power of the engines increased, the specific load grew from modification to modification: in the latest types of I-16, it reached 137 kg / sq. m, the "I-180", which was actually another, albeit a very deep modernization of the "donkey", the specific load exceeded the "mark" of 150 kg / sq.m. The I-185 fighter had to be equipped with an engine twice as powerful as the I-180, had a weight one and a half times greater than that of the I-180, but the wing area was even reduced. The result was an aircraft with an unprecedentedly large specific load of 220–235 kg/sq.m. Such a sharp jump in parameters meant a radical change in priorities in shaping the appearance of a fighter aircraft.

"I-185"

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The war definitely confirmed the correctness of the designer. The main type of combat maneuvering became a dynamic vertical maneuver, which required great strength and minimal resistance of the wing, i.e., a small wing with a high specific load. And the incredible, by the standards of the 30s, the horizontal speed of a fighter at 650-700 km / h became not a luxury, but an indispensable condition for the successful interception of bombers, whose speeds reached the level of 550-600 km / h by the end of the war. As a result, the main aviation powers ended the world war with fighters that had the following specific load values (kg / sq. M): - Tempest Mk-V (England) - 219; - "Mustang" D (USA) - 243; - "Thunderbolt" D (USA) - 214; - "Focke-Wulf" -190 D-12 (Germany) -233; - "Messerschmitt" -109K (Germany) - 213. Over the design of the wing and mechanization, the Polikarpov Design Bureau also "worked hard", as a result, the pilots'

feedback on the take-off and landing characteristics of a fighter with a specific load of more than 230 kg / sq. m were the most enthusiastic:

Huge payload for a fighter (500 kg of bombs, 8 "PC", 3 "ShVAK" with a colossal supply of shells). Excellent takeoff and landing properties of the aircraft. High speeds over the ground and in altitude, very good rate of climb - give me the right to conclude that the I-185 aircraft with the M-71 engine is one of the best fighters in the world ...

Test pilot P. Loginov, 1942.

Aircraft "I-185" M-71 according to their flight characteristics is higher than all existing domestic serial and foreign aircraft. In terms of piloting technique and takeoff and landing properties, the aircraft is simple and accessible to pilots of medium and lower secondary qualifications ...

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Report on state tests at the Air Force Research Institute in February 1942.

Personally, when I fly I-16, Yak-1, Yak-7B, LaGG-3, La-5, Hurricane and I-185 aircraft with M engines -71 and M-82, came to the following conclusion:

1. The transition from other fighter-type aircraft to the I-185 aircraft is simple and does not cause any difficulties for pilots.

2. The aircraft is easy to control in flight, very stable and without any whims. 3.

Performing takeoffs and landings exclusively simple.

4. The advantage of the aircraft is its exceptionally high vertical maneuverability due to its good rate of climb, which makes it possible to conduct air combat with enemy fighters, which is not always possible on Yak-1, Yak-7B and La-5 aircraft. 5. In horizontal speed, the I-185 has a

great advantage compared to domestically produced aircraft, as well as enemy aircraft ... The I-185 is the best fighter-type aircraft in terms of its ease of operation, speed, maneuver (especially on vertical), armament and survivability. Front-line pilots are looking forward to this aircraft to the front.

The commander of the 728th IAP, Captain Vasilyak, report on the military tests of the I-185 fighter, November 1942.

Speaking about the vertical maneuverability of the I-185, it is worth noting, in particular, that on the standard figure for assessing the dynamic rate of climb - the "combat turn" - Polikarpov's fighter gained 1500 meters of altitude ("Messerschmitt" Bf-109E gained only 500 m, "MiG -3" and "LaGG-3" 800 m each, the best "Messers" Bf-109F/G almost 1000 m). In air combat, an additional 500-700 meters of excess gave a decisive advantage ...

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> Despite the large load per square meter, the aircraft, thanks to an exceptionally successful combination of shapes, dimensions, excellent wing mechanization and a successful layout, has very high speeds and rate of climb, good maneuverability, and comparative simplicity in piloting technique ...
>
> And

Test pilot Stefanovsky, test report of the I-185 at the Air Force Research Institute, December 1942.

But, perhaps, in those days it was just customary to praise “the most advanced Soviet technology” in the reports? No, dear reader, the secret reports of the Air Force Research Institute are not at all an editorial in the Pravda newspaper. The Air Force Research Institute is a structural subdivision of the Air Force. This is the customer. And he is always inclined to thicken negative assessments, because he has to fight on these planes. And they will ask him: “Why can’t you gain air supremacy on the best fighter in the world?”

For example, in September 1942, military tests of a very good La-5 fighter took place on the Stalingrad Front. People's Commissar of Aviation Industry Shakhurin writes in his "correct" memoirs:

> In the autumn of 1942, a new Soviet La-5 fighter appeared in the sky over Stalingrad. The pilots liked the plane. Front-
>
> line tests of the fighter, which took place in an exceptionally tense environment, confirmed the high quality of the new combat aircraft.
>
> cars.

(98)

And in a secret report on military tests, which, of course, lay on the table of the people's commissar of the aviation industry (i.e., the main executor of orders for the Air Force), the following was written:

1. According to flight tactical and combat qualities:

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> A) In air combat with German Me-109F-4 and Me-109G-2 aircraft, the La-5 aircraft is significantly inferior to them both in vertical maneuverability and in horizontal speed. As a result, the La-5 aircraft cannot conduct active air combat with the German Me-109F-4 and Me-109G-2 fighters and is forced to conduct a defensive battle ...

So the enthusiastic assessments of the new Polikarpov fighter in the military test reports, as well as in the reports of the Air Force Research Institute, indicate that the I-185 was not just good, but phenomenally good. And when, knowing all these facts, you open the memoirs of A.S. Yakovlev and read the following fragment, the first thought that comes to mind is: “What kind of Polikarpov is Yakovlev writing about? About a namesake? So it wasn't like that…”

> Polikarpov had been unlucky lately, his authority was shattered, they stopped believing in him, and, worst of all, he himself seemed to be losing faith in his own strength ... During the period of Polikarpov's work on the I-180, he was designing new fighters at least a dozen newly created design bureaus ... Polikarpov, in a way, had to be designers who, although they did not have the experience and knowledge like him, were young, full of energy striving to so and compete With succeed at all costs and win for themselves and their design teams **the right to life** ***(highlighted by me.*** - M.S.) ... And now, after the monopoly position that he occupied for many years in our fighter aviation, he suddenly becomes convinced that he was **overtaken by young unknown designers** ***(highlighted by the author),*** the creators of the MiG, Yak and LAGG fighters, it was very difficult. He also understood very well, and, I think, deeper than any of the designers, that to be empty-handed in front of the Motherland at the most difficult time for her is not only a personal failure ...

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One of the greats said - if a person is talented, then he is talented in everything. A.S. Yakovlev, the namesake of the great Pushkin, was undoubtedly a talented person. And he writes well too.

Once you read it, you will not soon forget this phrase: “I found myself empty-handed in front of the Motherland at the most difficult time for her.” Sounds strong. Like a verdict of a revolutionary tribunal. It’s good that “young unknown designers” were found for such a case, in particular, Comrade Yakovlev himself, or else ... What would happen to the Motherland and to us?

Alexander Sergeevich writes well, brightly, figuratively, but only the words “to win the right to life” in his memoirs are not a metaphor at all. It's time, it's time for us to end the protracted conversation about horsepower, millimeters of armor and calibers of air guns and finally remember that the events of our sad story take place in the fall of 1938. According to the aviation history calendar, this is the time to complete the tests of the German Messerschmitt of the E series and prepare for the start (alas, only the beginning) of the I-180 tests. And according to the calendar of memorable dates of the Stalinist empire, the autumn of 1938 is the finale, this is the most dramatic moment of the most grandiose event in its history (and, probably, in the entire world history) to breed “rat kings”. For those who out of place

remembered the "Nutcracker", let us recall the essence of the method of breeding the "rat king". As you know, in the medieval city there were more rats than people. Sometimes, due to diseases, the carriers of which (including the bubonic plague) are rats, there were no people left in the city at all. Therefore, the fight against rats has been a task of vital importance for several centuries. This is not a very simple matter - the rat is smart, cunning, cruel. Ordinary cats are afraid to mess with her. And that's when the "rat king" method was invented. It is done like this: they catch two or three dozen hefty rats and put them in a large cage. Without food and drink. A few days later, a bunch of fetid, bloodied corpses and one, the strongest individual, remain in the cage. The one that was able to tear apart competitors and thus prove its “right to life”. This is the "rat king". Under the influence of the stress experienced, the psyche (if this term is applicable to rats)

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is violated - now, until his very last breath, he will attack and tear his relatives.

Stalin himself was such a "rat king." After the victory over Trotsky, Zinoviev and other “Leninist guards”, he could no longer stop - he regularly exterminated more and more generations of his comrades-in-arms (suffice it to recall the “Leningrad case” of 1949, during which those who did not even think about seizing state power were destroyed business executives - Kuznetsov, Voznesensky, Rodionov and others). The last wave of extermination (which began with the mysterious death of Zhdanov, continued with the arrest of the Minister of State Security Abakumov and the actual removal of the previously omnipotent Molotov from power) ended with the death of Comrade Stalin himself, who died under more than strange circumstances ... Let us return, however, to the year 1938.

The "political stage" was littered with torn corpses up to the very roof. The Chekists (by the way, in 1937-1938 the main backbone of the NKVD leadership consisted of three-quarters of the Cheka employees who began working in the "bodies" in 1917-1925) had already managed to arrest One Million Three Hundred Forty Five for "counter-revolutionary crimes" Thousands of people, 681 thousand of whom have already been shot, and 115 thousand died under torture during the "investigation" or died in prisons and camps. (101) The party and military leaders have already been renewed several times, the real "rat kings" tore up the drunken and fattened Soviet nobles of the first post-revolutionary generation. Now it remains only to complete the breeding of the "rat king" within the leadership of the NKVD itself. As of August 15, 1938, the heap of corpses inside

the NKVD numbered 1,862 Chekists arrested for counter-revolutionary crimes (we omit the quotes this time). Of the 37 leaders of the NKVD, who in November 1935 were awarded the personal ranks of “commissioner of the State Security Service of the 1st, 2nd, 3rd rank” (which corresponded to the rank of general in the army), only two survived until 1941. Five times during 1938, the owner of the chair of the head of the Moscow Regional Directorate of the NKVD changed (Zakovsky - from January 20, Karutsky - from April 20, Tsesarsky - from May 14, Zhurbenko - from September 15. Through

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two months and this one will be arrested, and Zhuravlev will be appointed in his place, who will go under the knife on January 13 of the next, 1939).

In the autumn of 1938, a bloody tangle of fights for the “right to life” approached the very top of the leadership of the “organs”. On August 22, one of the two main candidates for the Rat Kings appears in Moscow. On this day, Beria was appointed first deputy to the second main contender, People's Commissar of the NKVD Yezhov. Only one was supposed to survive. According to the version, very colorfully presented (but, unfortunately, not documented) by V. Suvorov in the novel "Control", the conspiracy to eliminate Stalin himself was scheduled for November 7th. On November 5, the head of the security department, Dagin, was arrested (the fourth chief guardian of the main body in the last two years). On November 6, the commandant of the Kremlin, Rogov, shot himself. On November 7, all the surviving Soviet people, in an atmosphere of unprecedented moral and political upsurge, celebrated the 21st ("point") anniversary of the Great October Revolution. On November 12, Litvin, head of the Leningrad NKVD, shot himself, Yezhov's closest ally (it was him that Yezhov proposed for the position of his first deputy). On November 15, the People's Commissar of the NKVD of Ukraine, Uspensky, wrote a note: “Look for my body in the Dnieper,” and disappeared. The individual was nimble and clearly dominant - he was caught only six months later. On November 22, the People's Commissar of the NKVD of Kazakhstan, Redens, was arrested. Finally, on November 25, 1938, Yezhov was removed from the post of People's Commissar of the NKVD of the USSR. Beria was

appointed in his place. But Stalin, apparently, is not yet sure of his choice, so Yezhov is left at large.

He was given the last chance, using a considerable number of his confidants, who are still in the structure of the NKVD, to break Beria and thereby prove his "right to life." But Yezhov is no longer capable of fighting. He drinks heavily and limply awaits his arrest, which took place on April 10, 1939. (101)

When the corpses were removed and the "political scene" acquired a relatively decent appearance, Stalin had to state that the operation was a complete success. The leadership of the NKVD significantly rejuvenated (the average age dropped to 35 years) and significantly improved health, including - and in the truest sense of the word. In place of the morphine and cocaine era

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Dzerzhinsky came normal worker-peasant guys with normal tastes (vodka) and inclinations (women). And with a much higher education (before the "purge" 35% with primary education and only 15% with higher education, after the "purge" respectively 19% and 34%). Only after the Great Massacre did the "organs" become truly popular and Bolshevik. Before the “purge”, 57% of the leadership (the 37 Chekist generals mentioned above) came from “socially alien” strata (clerks, merchants, bourgeois intelligentsia), moreover, 31% came to the Cheka from the Social Revolutionaries, anarchists, Bundists, or even from Bely movement. Finally, the national composition of the Beria leadership of the NKVD (80% are Russians and Ukrainians) is much more consistent with the national structure of the Soviet people, which were guarded by the Chekists. (101)

“And what does aviation have to do with it?” the reader will ask. Very even "at what". And not only because among the victims of mass terror were thousands of workers and engineers who worked in the aviation industry. In the context of large-scale preparations for the Great War, military aviation became both the "main cudgel" and the "main prize" in the fierce battle of the warring

clans. Dubina - because any disruption in the implementation of military aviation programs could be used as irrefutable evidence of the "sabotage activities" of high officials who had at least some relation to this program. It was a prize, because colossal money was allocated for the development of military aviation, and in foreign currency, which was used to buy up and steal Western technologies. To become the head of an aviation plant, an aviation design bureau, not to mention the people's commissariat of the aviation industry itself, is prestige, this is a "turntable" with direct access to the Kremlin, these are constant meetings with the Boss himself, this is money, apartments, cars, business trips abroad, this is a huge leap in path to power and privilege.

At the beginning of the big fight, Comrade Beria had the biggest "backlog". Even before he joined the leadership of the NKVD, the security officers managed to arrest almost the entire color of Soviet aviation thought. Tupolev, Yeger, Petlyakov, Myasishchev, Korolev, Glushko,

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Chizhevsky, Bartini, Nazarov, Charomsky, Putilov, Stechkin, Neman. They were arrested, but not shot.

In August 1938, a “special technical department” (STO) of the NKVD was created, where they began to gather arrested designers. Unfortunately, not everyone is so lucky. Only in 1938 were they shot: the head of TsAGI N.M. Kharlamov, head of the Air Force Research Institute, brigade commander N.N. Bazhanov, Head of the Main Directorate of the Civil Air Fleet I.F. Tkachev, the oldest aircraft designer, the creator of giant aircraft of the “flying wing” type K.A. Kalinin, developers of solid rockets (future Katyushas) G.E. Langemak and I.T. Kleymenov ... In the very first months of

his tenure as head of the NKVD, Comrade Beria worked to strengthen the engineering and design asset at his disposal. Moreover, unlike his predecessor - a sadist, drug addict and pederast Yezhov - he did this with exceptional gentleness, bordering somewhere on rotten bourgeois liberalism. ***“Beria fraudulently achieved before the authority*** (“instance” is Stalin, but the authors of the memorandum filed in the name of Khrushchev on February 23, 1955 are still afraid to pronounce this name) the ***conviction of 307 aviation specialists in absentia for various periods, indicating that the consideration of these cases in the usual procedure*** (i.e., arrest, torture cellar, meeting of the “troika”) ***is inappropriate, because this will tear the specialists away from their work ... ”*** And the specialists had a lot of work ahead of them. And according to

specialties.

On January 10, 1939, by order of Beria No. 0021, the Special Technical Bureau (OTB) was created in the structure of the NKVD. In September - October 1940, aviation specialists (and besides them, gunners, shipbuilders, chemists ...) were assigned to TsKB-29. Cadres decide everything. Numerous and highly qualified personnel turned the infamous "NKVD sharashki" into the largest design bureau in the country. The key problem in every business - the problem of motivating the labor activity of workers - was solved at an unprecedented level in world history. “Gingerbread” in the form of 20 grams of butter or a place on a bunk next to the stove (it was immediately provided to Tupolev “by seniority”), as well as a “stick” in the form of a possible shipment to taiga logging were by no means the only incentives. Not at all. Soviet engineers

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worked not out of fear, but out of conscience. At least that's what they tried to think. The outstanding designer of aviation diesel engines Charomsky later wrote: ***“Of course, everyone there (at the OTB) could not help feeling resentment and bitterness, but I told myself that the most harmful thing would be if this resentment began to play some role in the work. Therefore, I set up my employees with whom I was connected in the same way. The main thing is to forget about the offense. Its own party, its own government - it sometimes makes mistakes, but it also corrects mistakes. That was my political concept."*** The reader, of course, remembers that a similar “concept” and literally in the same expressions ***(“I will work even better”)*** was expressed by

one of the characters in D. Orwell’s novel “Animal Farm” ... The tasks set by the before OTB. Four projects were developed in its bowels. All of them involved the creation of aircraft of an unprecedented technical level for the Soviet aviation industry.

Petlyakov's group created the "product 100" - a long-range high-altitude fighter. It was planned to equip the aircraft with two M-105 engines with two turbochargers each, two pressurized cockpits, electro-remote control (it is easier to remove a bunch of fixed wires from a pressurized cabin than moving rods and cables). The estimated flight altitude was 12,200 meters, the range was 1,400 km, i.e., two to three times more than that of serial front-line fighters of that time. Perhaps the reader still remembers (see Chapters 3 and 4) that the operating altitudes of the bombers of that time did not exceed 6–7 km in any way. Therefore, the purpose of the "hundred" is still a mystery. Escorting your own bombers at an altitude of 12 km was of little relevance, since there were no enemy fighters capable of fighting at such an altitude. It is possible that this project was born on the basis of the "misinformation" about the incredible achievements of Western aircraft manufacturers, with which German and British intelligence regularly supplied foreign agents of the NKVD. The most fantastic project was the “product PB-4” (“ANT-57”)

- a long-range, heavy, 4-engine and, at the same time, a dive bomber. The aircraft was intended to fight enemy battleships, which he was supposed to hit.

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a super-heavy bomb accelerated in a dive to a speed that allows it to penetrate the armored deck of the ship. One can only guess who was to become this "opponent". According to the later memoirs of Jaeger and Bartini, when developing the PB, the English battleship Nelson and the Royal Navy base in Scapa Flow were considered as a typical object for bombing. The creation of an aircraft with such parameters exceeded the capabilities of aviation technology of the 40s, and it was not Scapa Flow that was to be bombed, but their own cities and railway stations occupied by the Germans. There are two memoir versions of the birth of the TB-4 project: according to one, the idea belonged personally to Beria, the friend - Tupolev himself insisted on creating an ultra-long "anti-English" bomber. Be that as it may, the development of the PB-4 continued for almost the entire 1939 year. Thus, time was wasted, which could have been more usefully used for work on really promising projects "102" and "103". At the beginning of 1940, a group of designers led by Myasishchev (the future creator of jet strategic

missile carriers) began work on "product 102". They had to create a high-speed, high-altitude, long-range bomber with a take-off weight of 16–17 tons. The aircraft with an unusually long and very thin (diameter 1.6 m) fuselage was amazingly beautiful, it was also planned to install turbochargers, pressurized cabins, and remotely controlled machine gun turrets. This project (and it was implemented in metal and its flight tests continued right up to 1945), like a great many others, was destroyed by engines, that is, the lack of powerful and reliable engines and turbochargers. The 102nd was conceived as a twin-engine aircraft, and with its take-off weight, engines with a unit power of 2000 hp were required. The war ended before such engines (M-120, M-71, M-90) were brought to perfection. In a word, the country's best aviation specialists have done a colossal amount of work. What did the Motherland get from this - in the most difficult time for her? Projects 100, 101, 102 were

united by two words: "far and high-altitude". Therefore, these projects were twice

First, still Soviet

the aircraft engine industry, even after five years, was unable to establish serial production of turbochargers suitable for operation in combat units (and not in conditions of a flight test station). Without this key unit, "high-altitude" did not work. Nowhere and no one. Strictly speaking, at the end of the war, the Germans significantly increased the altitude of their engines by injecting nitrous oxide into the working mixture, but this method (not to mention the additional weight of the unit and nitrous oxide) led to a sharp increase in the combustion temperature, required the use of heat-resistant materials in the engine design, and for this reason turned out to be inaccessible to our aircraft engine industry. Secondly, "in the most difficult time" there was no need to fly far at stratospheric heights. The enemy approached by himself, and his tank columns passed 50–60 km a day. In such a situation, even the “long-range” DB-3f bomber in service had to be used as a “battlefield aircraft”, and the inability of this aircraft to dive bombing was compensated by bombing from small and extremely small

heights.

Project 103 ("ANT-58/59", the future "Tu-2") ideally met the tasks that had to be solved by front-line bomber aviation. In January 1941, it was no longer a "project", but a real flying aircraft. It would seem that all that remained was to launch it into a series and ... And nothing of the kind happened. Because the supposedly "omnipotent Beria" was omnipotent only inside his people's commissariat. At a certain (very limited, by the

way) moment in time, he could recruit designers from all over the country "in absentia", even without formal charges and a tragic farce with "investigation" and "court". He could force the employees of his OTB to produce drawings and calculations with exorbitant productivity. And all this remained nothing more than a "big sandbox" in which adult uncles sculpt sand cakes and feed dolls with them. The sandbox turns into a capable design bureau when a factory appears. A powerful factory, on the basis of which you can turn ideas into designs. And you also need access to the only TsAGI wind tunnel in the country, in which it was possible to blow

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life size aircraft. And a lot more of the only thing claimed by other clans no less close to the Master.

There were many aircraft factories in the USSR in the late 1930s. At least 20, and their number grew rapidly as "backup plants" were built in the east of the country. But behind the loud name - "aircraft factory" and the mysterious number, anything could be hidden. So, the first of the Yakovlev aircraft adopted by the Red Army Air Force - the training "UT-2" - was manufactured at plant No. 115 in Moscow. Zavod No. 115 is a bed workshop located in a one-story building on Leningradskoye Shosse in Moscow. Moreover, the plane and the beds were made at the same time. Then the UT-2 aircraft was handed over for serial production to plant No. 47. Plant No. 47 is an aircraft repair shop in Leningrad. The I-26 fighter (the future Yak-1) was made at plant No. 115 (in the bed workshop), and for serial production it had to be transferred to plant No. 301. Plant No. 301 is a furniture factory in Khimki. In fact, the production of the Yak-1 was deployed at plant number 292 - this is the Sarcombine plant (agricultural engineering plant in Saratov). There were many such factories. In reality, four-fifths of the total production of combat aircraft was

produced by "four and a half" gigantic factories. During the 1930s, these factories were strictly specialized. No. 1 in Moscow made Polikarpov's biplane fighters ("I-5", "I-15", "I-153"). No. 21 in Gorky produced the I-16 and the UTI training fighter. Moscow Plant No. 22 made Tupolev bombers ("TB-1", "TB-3", "SB"). After the arrest of Tupolev and most of his "team", the Arkhangelsk Design Bureau (Tupolev's student, the leading developer of the SB-Ar series) remained at the 22nd plant. No. 18 in Voronezh and No. 39 in Moscow were the "patrimony" of Ilyushin. Plant No. 18 was much larger than No. 39, three-quarters of the pre-war DB-3s and DB-3fs were made in Voronezh (which is why we designated Moscow Plant No. 39 as a "half" next to the giants).

This group of leading factories represented the “prize fund” for which the clans fought fiercely. And inside the prize fund there was a super prize - Plant No. 1 in Moscow. This is the oldest aviation plant in Russia, which began production of aircraft

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back in 1909, and by 1939 it had become a huge enterprise equipped with the latest imported equipment. It was after visiting the Moscow plants No. 1 and No. 22 in April 1941, the German air force attache G. Aschenbrenner wrote in the report provided to Goering the following: “Each of these plants was a gigantic enterprise, where up to 30 thousand people worked in each ***of the three shifts*** (highlighted by the author), ***the work is perfectly organized, everything is thought out to the smallest detail, the equipment is modern and in good condition ... ”*** It is not difficult to see

that the Polikarpov Design Bureau (two of the four leading plants, including the “superfactory” No. 1) “settled” the best. In addition, Polikarpov's design bureau was also the largest in terms of the number of engineering personnel (358 people at the beginning of 1940). Already in the next largest design bureau of Ilyushin, there were 2 times fewer employees (181 people), in the Arkhangelsk design bureau, after numerous "landings", there were still 162 designers. This brief review makes it clear why all the efforts of ***the “young unknown designers” (more*** precisely, the nomenklatura clans behind them) were aimed at “filling up” Polikarpov - there was something to profit from. In addition, ***“young, full of energy and aspirations”,*** but at the same time ***“who did not have the experience and knowledge like him”*** could overtake the “king of fighters” in only one way: by tripping him up, or even better, simply dropping him off the “ treadmill."

At first glance, it was very easy to do this, because who is he, this Polikarpov? Non-party, social origin - "from the family of a religious minister", convicted (in the 30th year, Polikarpov was arrested as part of a general campaign of arrests and executions of "bourgeois wreckers"). With such personal data, Polikarpov, according to all the laws of statistics and dialectics of the class struggle, should have ended up, at best, where Tupolev, Petlyakov and other socially alien engineers were already sitting. Moreover, in addition to all the "compromising evidence", he was also an intelligent man of the old Russian sample, in all the features of his character, completely helpless in a rat fight. Here is how Shakhurin, People's Commissar for the Aviation Industry, describes Polikarpov in his memoirs:

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I liked to communicate with Nikolai Nikolayevich. Exceptional erudition, knowledge of flying, aviation theory, rich experience in creating aircraft - all this distinguished Polikarpov and contributed to his authority in the domestic and world aircraft industry ... Despite his worldwide fame, he was extremely modest. I

have never met another such person in my life. With modesty, Nikolai Nikolayevich stood out even among our youth - designers who at that time were making their first cars. He always spoke quietly and folded his hands down in a special way. If I had to give him a negative answer, he quietly

agreed:

- Good good. But he

didn't leave, and just as tactfully, but persistently, he began to motivate this or that request again ... I was struck by the exceptional efficiency, clarity and discipline of Polikarpov, who was very diligent in implementing the decisions made on his aircraft ...

But - "the eye sees, but the tooth is dumb" ... Let's start with the fact that Polikarpov designed his legendary fighters within the framework of the "Central Design Bureau" (TsKB), and this same TsKB was created not by the People's Commissariat of Aviation and not the People's Commissariat of the Defense Industry, but "economic department of the OGPU. And therefore, for the time being, there were no people who wanted to fight with the organization that was part of the GPU-NKVD structure. True, in 1938 everything changed, and now even a casual acquaintance with the former leadership of the OGPU, completely eliminated, has become mortally dangerous. But Polikarpov and his design bureau still retained the "right to life." One of the possible explanations for this phenomenon can be considered the fact that since 1933 the permanent chief pilot of the Polikarpov Design Bureau was V.P. Chkalov.

In the leadership of the Stalinist empire, as is customary in mafia gangs, formal status meant almost nothing, and actual proximity to the leader meant everything. All-Union grandfather Kalinin was Chairman of the Presidium of the Supreme Soviet, and